Technical Reference Manual

Base-N-aBox M3 RTK Bridge

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This document describes the features, capabilities, and proper setup of the Base-N-aBox M3 RTK Bridge (Rev A). The Base-N-aBox M3 Represents the THIRD generation of RTK Bridges which allow non-internet equipped systems to login in to internet correction sources to achieve DGPS and RTK positioning.

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Introduction

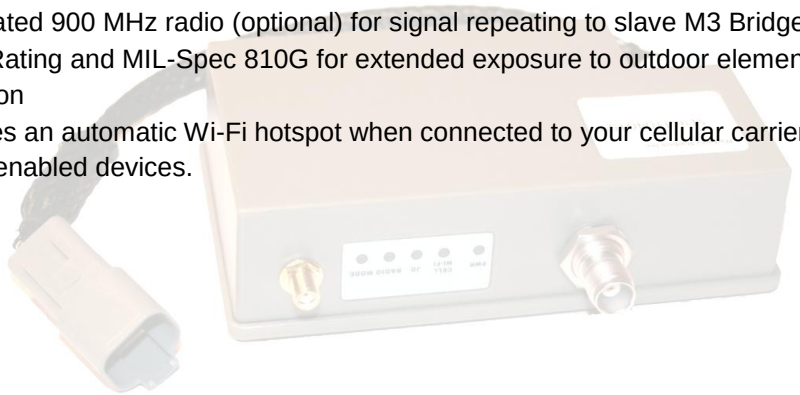
Congratulations on your purchase of the Base-N-aBox M3 RTK Bridge! The M3 RTK Bridge represents the third generation of RTK Network communications devices allowing any brand of roving receiver to easily and reliably connect to any internet GPS/GNSS Corrections source all the while being managed remotely without any interaction required on the end-users part.

Key Features:

- Connects to NTRIP Casters to retrieve DGPS and RTK corrections
- Connects to direct TCP/IP port streams to retrieve DGPS and RTK corrections
- Supports NTRIP authentication
- Supports Single Base Corrections and network corrections such as: Geo++'s Pseudo Reference Stations (PRS), Trimble's Virtual Reference Station (VRS), Topcon's Modeled Reference Station (MRS), Geo++'s Flat Plane Correction (FKP), RTCM 3.1's Master Auxiliary Concept (MAC), and Leica's MAX/iMAX.
- Compatible with all external radios and GPS receivers (cables required)

Unique Features:

- Integrated 2G / 3G & 4G Cellular Modem able to roam on any GSM or CDMA carriers network
- Communications pecking order, which intelligently and automatically scans looking for DGPS and RTK Corrections from GSM/CDMA, Wi-Fi, and 900 MHz
- Remotely monitor and reconfigure while device is in operation, but still supports local reconfiguration via terminal emulation
- Standard RS232 port for easy cable setup and prototyping
- Cached GPS positions allows M3 to function without position from internal GPS receiver improving its robustness over older generation RTK Bridges
- High performance integrated aGPS receiver (no external cables required) that will typically achieve a positional fix in under 10 seconds
- Integrated 900 MHz radio (optional) for signal repeating to slave M3 Bridge systems
- IP67 Rating and MIL-Spec 810G for extended exposure to outdoor elements and long term vibration
- Creates an automatic Wi-Fi hotspot when connected to your cellular carrier for use by other Wi-Fi enabled devices.

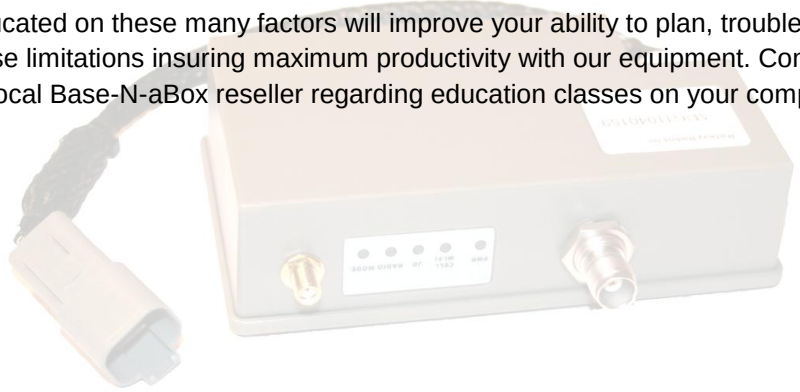


Disclaimer

While every effort has been made to ensure the completeness and accuracy of the Base-N-aBox RTK Bridge Users Guide (this document), Base-N-aBox assumes no responsibility for omission and errors. Nor is any liability assumed for losses or damages resulting for the user of the information contained herein.

As with all wireless communication devices and GPS systems, numerous factors affect the availability and accuracy of these systems (e.g. obstructions, interference, system maintenance, availability, etc.). Therefore, Base-N-aBox, your cellular provider, your GPS/GNSS corrections provider and even the manufacturer of your GPS system cannot guarantee the accuracy, continuity, or availability of the complete system due to the numerous variables.

Being well educated on these many factors will improve your ability to plan, troubleshoot, and overcome these limitations insuring maximum productivity with our equipment. Contact your Base-N-aBox or your local Base-N-aBox reseller regarding education classes on your compete equipment setup.



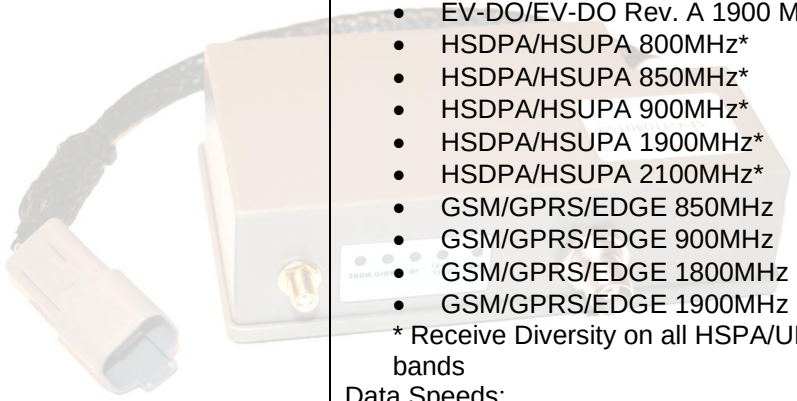
FCC Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at their expense.

Modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment under FCC rules.

97 ## Specifications

Size	35 mm x 79 mm x 140 mm (1” x 3” x 5.5”)
Weight	450 g (1.0 lbs.)
Voltage Range	9 – 25 VDC
Max Power Consumption	1 amps at 12VDC when Wi-Fi & 900 MHz active
Operating Temperature	-30°C to +70°C (-40°F to +158°F)
Storage Temp Range	-40°C to +85°C (-40°F to +185°F)
Humidity	100% Condensing
Ruggedness Rating	IP67 MIL-STD-810G 527
Cellular Functionality	Compatibility: • EV-DO/EV-DO Rev. A 800MHz* • EV-DO/EV-DO Rev. A 1900 MHz* • HSDPA/HSUPA 800MHz* • HSDPA/HSUPA 850MHz* • HSDPA/HSUPA 900MHz* • HSDPA/HSUPA 1900MHz* • HSDPA/HSUPA 2100MHz* • GSM/GPRS/EDGE 850MHz • GSM/GPRS/EDGE 900MHz • GSM/GPRS/EDGE 1800MHz • GSM/GPRS/EDGE 1900MHz * Receive Diversity on all HSPA/UMTS/EV-DO/CDMA bands Data Speeds:



	• HSDPA/HSUPA DL/UL – 7.2 Mbps/5.76 Mbps • WCDMA DL/UL – 384 kbps/384 kbps • GSM DL/UL – 14.4 kbps/14.4 kbps • GPRS DL/UL – 85.6 kbps/42.8 kbps • EDGE DL/UL – 236.8 kbps/118.4 kbps • EV-DO FL/RL – 3.1 Mbps/1.8 Mbps • CDMA 1xRTT FL/RL – 153 kbps/153 kbps
Cellular Connector	TNC Female
Wi-Fi Capabilities	Client, WAP (Wireless Access Point) 802.11 b 802.11 g WEP WAP WAP2
Wi-Fi Antenna	No Connector (Internal Antenna)
900 MHz SSR Transceiver	SMA Female FHSSR – Frequency Hopping Spread Spectrum 100 – 1000 mW Selectable Master / Multiple Slave
L1 GPS	No Connector (Internal Antenna) Standalone Positioning and aGPS Indoor GPS utilizing OneXTRA Position caching for indoor operation with complete GPS blockage TTFF < 10 seconds
Serial	3 Wire RS232 MOLEX – Numerous Connector Solutions

Power Connector	2 Wire MOLEX – Numerous Connector Solutions Available (see parts listing for complete list): • SAE • Unterminated • Serial power using device power
Status Indicators	5 Status Lights (Power, Cellular/Wi-Fi, John Deere Translator, Radio, Mode)

Other Features

- Rooftop Mounting Bracket(s)
- IP67 Industrial Cables with EMI Protection
- Embedded LINUX Processor for easy upgrades
- Remote firmware and reconfiguration

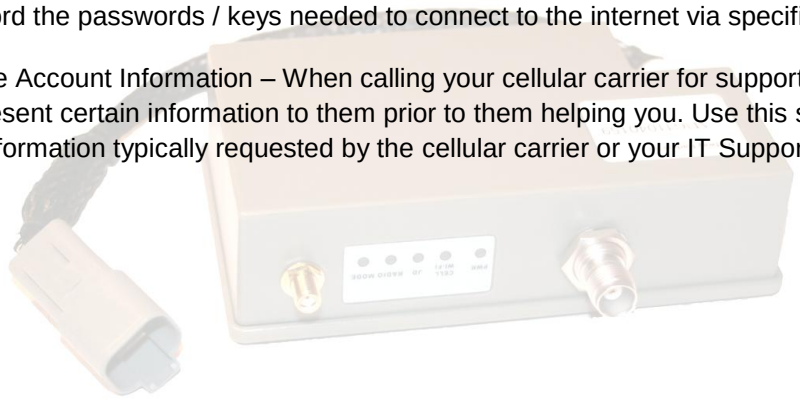
Configuration Worksheets

The following pages can be used to record configuration information that you've loaded in to the Base-N-aBox M3 RTK Bridge:

The Base-N-aBox M3 RTK Bridge supports only one correction stream for RTK and DGPS corrections, use this section to record the specific connection details assigned to you by the correction provider(s), you can either have the information modified over the air by contacting Base-N-aBox or by using the optional programing kit.

Wi-Fi Passwords – Wireless hotspots can be encrypted to prevent unauthorized access, use this section to record the passwords / keys needed to connect to the internet via specific access points.

Cellular Device Account Information – When calling your cellular carrier for support you will be required to present certain information to them prior to them helping you. Use this section to record specific key information typically requested by the cellular carrier or your IT Support group.



Accounts

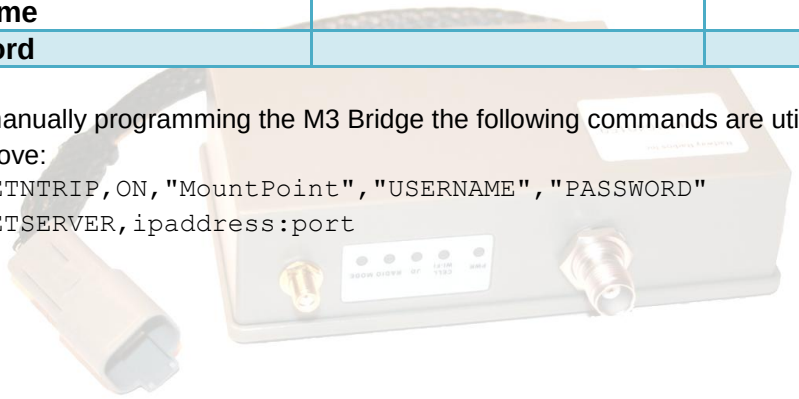
Use the section below to record your **Programmed Accounts** (aka Profiles) for future reference.

Note: Usernames and Passwords are case **SENsitiVe**.

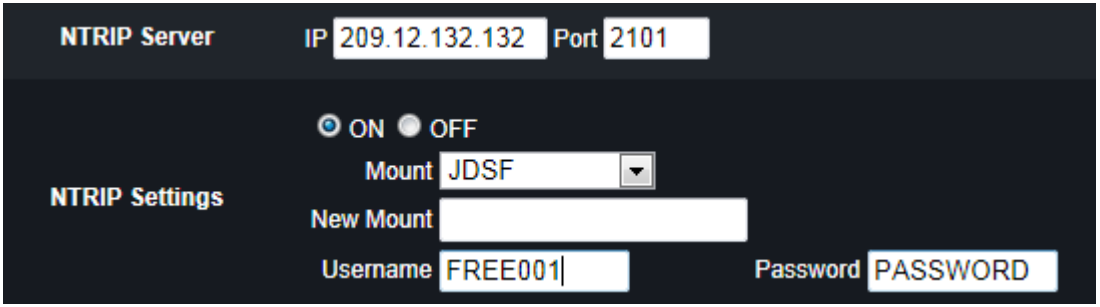
	RTK Provider 1	RTK Provider 2
Description		
Mode (RAW / NTRIP)		
Server IP / Port		
Mount Point		
Corrections Type		
RTK Username		
RTK Password		

Note: When manually programming the M3 Bridge the following commands are utilized to enter the information above:

```
$PPNI,SETNTRIP,ON,"MountPoint","USERNAME","PASSWORD"
$PPNI,SETSERVER,ipaddress:port
```



When using the online tool: press the “Retrieve Current Settings” button then modify the information to reflect the desired configuration.



Wi-Fi Passwords

The section below is for you to record any **Wi-Fi Passwords** for future reference:

SSID	Encryption Type	Password

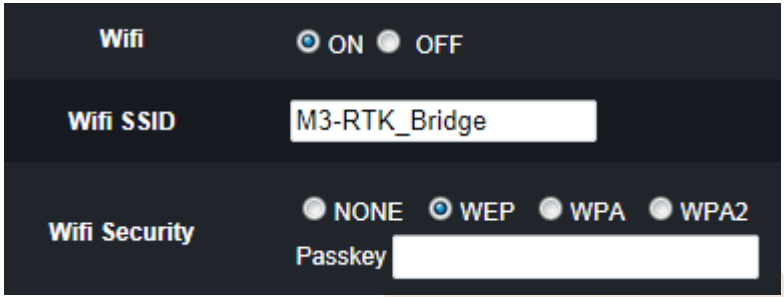
Note: When manually programming the M3 Bridge the following commands are utilized to enter the information above:

- `$PPNI,SETWIFI,ON`
- `$PPNI,SETWIFISEC,WPA,"M3"`
- `$PPNI,SETWIFISSID,"M3-RTK_Bridge"`

Where NONE is the type of security (WPA, etc.) and `"M3-RTK_Bridge"` is the default access point name for all M3 Modems. If you configure a lot of these, setting up a secured Access Point (AP) named `"M3-RTK_Bridge"` with a password of `"M3"` will allow you to access the unit without an activated mobile data plan or if you simply reconfigure your mobile hotspot to the above settings the M3 RTK Bridge will automatically start using it.

The SSID cannot have spaces or special characters in the initial firmware version.

When using the online tool: press the “Retrieve Current Settings” button then modify the information to reflect the desired configuration.



Rules for the Wi-Fi settings:

1. If you want the M3 to CONNECT to a Wi-Fi hotspot then you MUST setup security on the Wi-Fi access point, and enter the equivalent values of SSID, WEP/WPA/WPA2 with the correct passkey.
2. If you want to use the M3 as a HOTSPOT then you need to select NONE as the security type and your connecting device must have allow “ADHOC” connections. For example: `$PPNI,SETWIFISEC,NONE," "`

Cellular Accounts

The section below is for you to record all critical information for the internal cellular modem:

	Carrier 1 _____	Carrier 2 _____
Cellular Provider		
Support #		
Account #		
Account Holders Name		
Account Password		
Device ESN# or SIM Card #		
Data Plan Type		
Username		
Password		

Note: When manually programming the M3 Bridge the following commands are utilized to enter the information above:

- `$PPNI,SETBEARER,"USERNAME","PASSWORD","APN",0` (see following pages for more information on the USERNAME, PASSWORD, and APN.)
- `$PPNI,CARRIER,,HSPA`

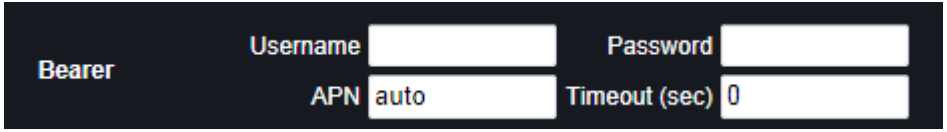
Where HSPA is the Cellular technology to be utilized (HSPA, UMTS, EVDO, CDMA).

For example if you are utilizing AT&T within the USA for your GSM provider the following would apply:

```
$PPNI,SETBEARER, , ,"BROADBAND",0
```

You will want to verify the appropriate APN with your service provider as different plans may have different APN's allowed.

When using the online tool: press the "Retrieve Current Settings" button then modify the information to reflect the desired configuration.



Common Carrier Dial Strings

The table below is a list of common carrier Usernames, Passwords and APN's that may be required to stream TCP/IP data from the internet to an industrial modem such as our M3 RTK Bridge, please refer to your local carrier for their specifics on configuring your device:

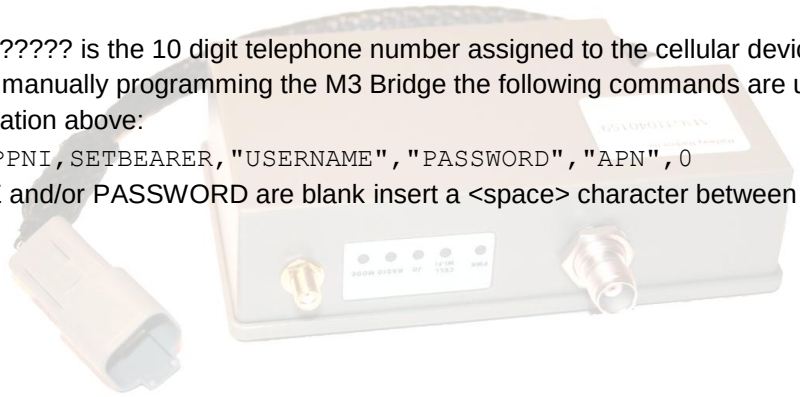
Carrier	Username	Password	APN
Verizon USA	??????????@vzw3g.com	Vzw	<blank>
AT&T USA	<blank>	<blank>	isp.cingular or BROADBAND
Sprint PCS	<blank>	<blank>	<blank>
T-Mobile USA	<blank>	<blank>	wap.voicestream.com or internet2.voicestream.com
Alltel USA	??????????@alltel.com	alltel	<blank>
Nextel USA	<blank>	<blank>	Leave "Passkey" blank if prompted
Rogers Canada	wapuser1	wap	Internet.com
Cingular Blue		<blank>	proxy
Cingular Orange	WAP@CINGULARGPRS.COM	CINGULAR1	wap.cingular or

			ISP.CINGULAR
Vodafone Spain	wap@wap	wap125	airtelwap.es
Vodafone UK	user@vodafone.net	user	wap.vodafone.uk
SwissCom	<blank>	<blank>	gprs.swisscom.ch
T-Mobile NL	<blank>	<blank>	internet
Bell Canada	??????????@1x.bell.ca	VoicemailPIN	<blank>
Telus	<blank>	<blank>	<blank>
O2 Ireland	gprs	gprs	wap.dol.ie
O2 Germany	<blank>	<blank>	wap.viaginterkorn.de
O2 Holland	<blank>	<blank>	Internet
O2 UK	o2wap	password	wap.o2.co.uk

Notes:

1. ?????????? is the 10 digit telephone number assigned to the cellular device.
2. When manually programming the M3 Bridge the following commands are utilized to enter the information above:
   - `$PPNI,SETBEARER,"USERNAME","PASSWORD","APN",0`

If USERNAME and/or PASSWORD are blank insert a <space> character between the commas.



M3 RTK Bridge Setup

The Base-N-aBox RTK Bridge has three distinct items that much be setup:

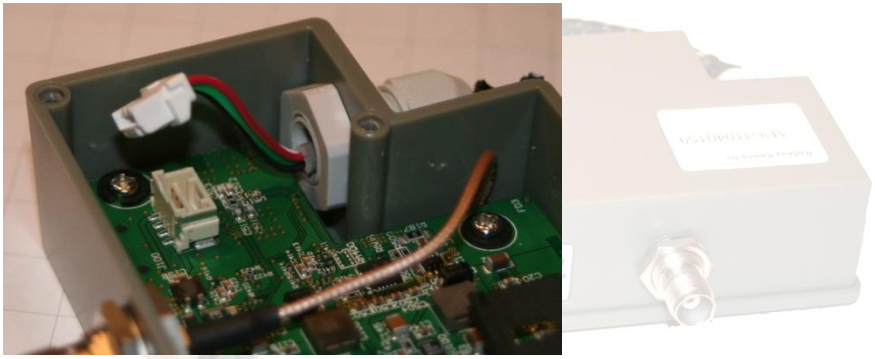
1. **At least one Internet connection**:
   - Internal Cellular Modem (by default it is HSPA/GSM)
   - Wi-Fi to an access point called "`M3-RTK_Bridge`"

   If no internet connection is available the modem will scan for an already active a streaming M3 and will utilize the corrections from that modem's connection.
   If the Wi-Fi Option has been purchased and a cellular connection was successful your JRD-150 will become a Wi-Fi hotspot that you can utilize with other Wi-Fi enabled devices.
2. **GPS Position** (Not required for some connections - Best solution chosen automatically in the following order):
   - Data Port In (from RTK System – if available)
   - Internal GPS Receiver
   - Cached Position (last position stored)
3. **Account to access an RTK Data Stream**
   - Internet Enabled Base Station (Raw stream –GPS Position not needed)
   - Closest CORS IP (Raw stream selected based on closest base station to GPS Position)
   - NTRIP Caster (Single Base – GPS Position not needed)
   - NTRIP Caster with GGA (Closest or Network Solution based on GPS Position)

The easiest and quickest way to configure the M3 is to simply call your Base-N-aBox M3 dealer and have them do it on the WWW. There are no requirements to this step as the M3 RTK Bridge can be reprogrammed even when it is not on.

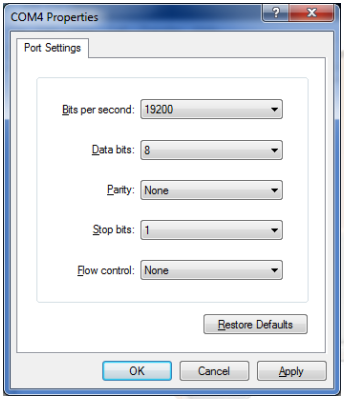
To **MANUALLY** configure the Base-N-aBox M3 RTK Bridge:

1. Connect all the antennas as you would when operating the RTK Bridge.
2. Remove the cover on the modem as you would for installing a SIM card.
3. Disconnect the small white MULEX connector by gently releasing the retaining clip while gently pulling up on the connector:



4. Connect the programming cable (M3-PROG-05) to the now open MULEX jack and the other end to an available COM port on any computer. A USB to serial adapter may be required.

5. Power On the M3 RTK Bridge by plugging in the power adapter supplied with the programming cable.
6. Should see green PWR light indicating that the bridge has acceptable power
7. Wait until Mode light is red indicating that it has fully booted.
8. Start any hyper terminal type program on your computer. A freeware version can be downloaded from: http://www.hilgraeve.com/hyperterminal-trial/
9. Select the correct COM port (to find the COM Port number for USB adapters right-click on My Computer then select Manage, then highlight Device Manager, then expand Ports [COM & LPT] to see a listing of all the ports).
10. The M3's default serial setup is 19200, 8, None, 1 and None for flow control. Once these parameters have been set press the "OK" button.



11. Issue a `Control+Z` key sequence to switch the modem in to Debug / Shell (aka Setup) Mode, your SN and firmware version will display.

```
Debug Shell SN:M3G11040185 Version:1.16.7446, Fri Dec 16 17:11:36 MST 2011
```

At this point it is recommended that you issue the `GETALL` command to display all the current settings which are loaded in to the M3.

Other helpful Terminal commands are:

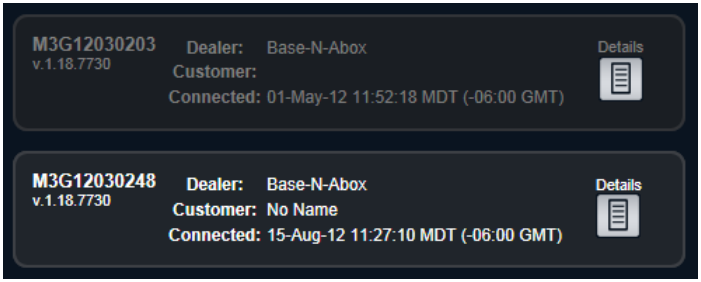
a. `$PPNI,EXIT` – which will return the M3 to normal operation if nothing has changed, or will reboot if changes have been made to any of the parameters.
b. `$PPNI,RESET` – will reboot the receiver utilizing the new settings.

See the following section for an explication of the various commands and options.

To configure the Base-N-aBox M3 RTK Bridge via the **WEB INTERFACE**:

1. Start your favorite browser application, and then enter into the Address bar (not the search bar): https://199.204.215.130:8081 then select the “continue to the site anyways” option if you have certificate verification enabled.
2. Enter your dealer username and password.

3. Once authenticated you will see a listing off all the bridges under your admin control. Bridges which are online are shown in white; those which are offline are grey.



4. Select the details dialog to update the settings. New settings will be pushed to offline bridges once the power on the next time.

Other helpful online commands which can be issued from the Control tab on the “Command” line are:

a. `GETALL` – will display all the internal settings of the M3 RTK Bridge
b. `EXIT` – which will return the M3 to normal operation if nothing has changed, or will reboot if changes have been made to any of the parameters.
c. `RESET` – will reboot the receiver utilizing the new settings.

See the following section for an explication of the various commands and options.

Command Listing

From multiple locations a GETALL can be sent to the M3 which will provide a complete command listing such as:

```
basenbox>getall
$900MHZ=OFF
$BAUD=19200
$BEARER=,,auto,0
$CARRIER=,HSPA
$CONFIG=0.0.0.0:0
$DOWNLOAD=204.244.124.58
$GGARATE=10,ON
$GOBIFW=generic
$JD=ON
$NTRIP=ON,RTCM5EQC,lague1,lague
$PARITY=NONE
$ROAM=OFF
$ROAMLIST=OFF
$RTK=ON
$SERIAL#=M3G12030248
$SERVER=204.244.124.57:2102
$WIFI=OFF
$WIFISEC=NONE,""
$WIFISSID=ppni
$VERSION=1.18.7730,Thu Mar 15 14:47:14 MDT 2012
```

900MHZ – This value can be either ON or OFF. When ON, the M3 will duplicate the data stream from the serial port then send it out its internal (optional) 900MHz Transceiver. This feature allows One M3 modem to backup an unlimited number M3 modems within range should they lose their internet connection. This is a great feature when utilizing multiple machines within a couple of km's of each

other. The default for this feature is OFF as it will reduce the EMI levels for improved GPS tracking on receivers which have poor EMI filters.

HyperTerminal Example: `$PPNI,SET900MHZ,OFF`

Online Control Tab: `SET900MHZ OFF`

BAUD – This field should be set to the expected data rate on the RTK Receiver to which the M3 is supplying corrections too.

Notes:

1. Deere direct connect systems should always be 19200
2. Some versions of firmware for the Trimble FMX and FM1000 do not allow simultaneous output of NMEA and input of CMR from Port D. If this is the case then the GGA message returned to your RTK Corrections provider will be the GGA as calculated from the M3
3. On some Trimble Receivers: If you are using 19200 or 38400, the input rate must match the output rate.
4. On some Trimble Receivers: If Port A is operating at 19200, Port B can operate at 1200, 2400, 9600, or 19200 (not 38400).
5. On some Trimble Receivers: If Port B is operating at 38400, Port A can operate at 1200, 2400, 9600 and 38400 (not 19200).

HyperTerminal Example: `$PPNI,SETBAUD,19200`

Online Control Tab: `SETBAUD 19200`

BEARER – Is used to configure the authentication with your selected cellular / mobile data provider. The default for the M3 RTK Bridge is AT&T which utilizes `isp.cingular` as its primary contract data plan. The BEARER field is comprised of 4 values:

1. Username assigned to you by your CELLULAR provider (do not confuse this with the username supplied to you by your RTK corrections provider). Most usernames and passwords assigned to you by carrier can be found in an early section of this document. If this value is blank enter a <space> character when entering the entire line.
2. Password is also assigned by your cellular / mobile data provider. If this value is blank enter a <space> character when entering the entire line.
3. The APN or Access Point Name is a configurable network identifier used by a mobile device when connecting to a GSM carrier such as AT&T, T-Mobile or Rogers. The carrier will then examine this identifier to determine what type of network connection should be created.
4. The last parameter is the timeout value in seconds. You can utilize this value to reset the connection if it has not connected to the mobile data provider within the specified time. The default of zero tells the M3 to continue an unending attempt to connect.

HyperTerminal Example: `$PPNI,SETBEARER, , , "isp.cingular",0`

Online Control Tab: `SETBEARER " " " " "isp.cingular" 0`

CARRIER – Is a country specific configuration value that determines the firmware that is dynamically loaded into the multiband cellular data modem on startup : HSPA, UMTS, EVDO, CDMA are currently supported as of the writing of this document.

HyperTerminal Example: `$PPNI,SETCARRIER, ,HSPA`

Online Control Tab: `SETCARRIER " " HSPA`

DOWNLOAD – This value should NOT be modified except as directed by a Base-N-aBox support rep as any value other than 204.244.124.58 will disconnect the system from the online support system.

GGARATE – Determines the interval at which the M3 Modem sends the RTK Server updates on its current position via an industry standard GGA message. It is not recommended to change this value as most VRS style servers may disconnect you if they have not received an updated position within 30 seconds.

HyperTerminal Example: `$PPNI,SETGGARATE,10,ON`

Online Control Tab: `SETGGARATE 10 ON`

GOBIFW – This value should NOT be modified except as directed by a Base-N-aBox support rep. The GOBI Firmware is a country / carrier approval type. The ”generic” GOBI firmware is utilized for about 90% of the world’s cellular carriers.

HyperTerminal Example: `$PPNI,SETGOBIFW,"generic"`

Online Control Tab: `SETGOBIFW "generic"`

JD – The ability to modify this flag is determined by your John Deere subscription status with Base-N-aBox or one of its affiliate RTK networks which are authorized to resell this feature along with their correction services. When JD is set to ON, the M3 RTK Bridge will communicate with the John Deere RTK Receiver via its Radio interface. The M3 RTK Bridge does NOT connect to the CANBUS or any other critical system of the tractor. The M3 may be directly connected to the Deere Receiver or connected to a specially programmed FreeWave 900 MHz radio to broadcast Deere Corrections to all systems within range tuned to the correct Channel and Network ID.

HyperTerminal Example: `$PPNI,SETJD,ON`

Online Control Tab: `SETJD ON`

Direct connection to the Deere ITC or 3000 receivers requires the following cable: M3-JD-07

NTRIP – One of the most commonly modified settings on the M3, the values of the NTRIP fields are determined by your RTK corrections provider. Four fields make up the NTRIP command line:

1. Status (either `ON` or `OFF`). If `OFF` the M3 is transferring raw TCP/IP data and is not utilizing the industry standard NTRIP protocol.
2. `"Username"`
3. `"Password"`

4. "MountPoint" must be entered EXACTLY as it is defined by your RTK Network provider. This field is case SensITIVe.

NTRIP is simply a security overlay on standard TCP/IP based roughly on HTTP. It provides a readable table of “Mount Points” that systems can login to for access to DGPS and RTK Corrections. NTRIP Casters are usually deployed by Private RTK Networks or State DOT networks who charge subscription fees for RTK Corrections. For more information on NTRIP see the Appendix E of this document.

A Mountpoint (NTRIP Only) is usually a secured point of access for a GPS/GNSS data stream. Your RTK corrections provider should be able to recommend the optimal stream for your system. As a general rule:

- Trimble Ag System in North America must use a CMR corrections source (Trimble Ag systems will ignore GLONASS, L2C and L5 corrections from all systems except: other Trimble receivers / VRS Networks, GoDigiFarms Midwest Network, newer MyWay RTK base stations and some specialized GNSMART networks such as SignalOne in Ohio and the Freedom RTK Network in Kansas). Also the new CHC Navigation receivers such as the N71 will also produce Internet RTK corrections compatible with Trimble Ag Receivers.
- Topcon Ag should always use RTCM 3.x corrections and will have trouble with some VRS networks as they do not properly utilize the RTCM3 residuals messages. These systems may also experience long periods of RTK Float during summer afternoons if you are too far from a physical reference station.

- John Deere SF2 systems in North America and some other countries must utilize the “JD=ON” feature or be operating on a specialized translation server such as those operated by Signal One, or Freedom RTK.
- AutoFarm A5 must utilize a CMR+ data source and will not operate properly on VRS style networks (the base station must always be in the same locate for it to hold A-B lines.
- For all systems RTCM 2.x on 2G Networks should be avoided due to its large data packet size which can cause high latency when a full constellation of Satellites is in view.

HyperTerminal Example1: `$PPNI,SETNTRIP,ON,"RTCM3_NAD83","Joe01","A3b4D5"`

HyperTerminal Example2: `$PPNI,SETNTRIP,OFF, , ,`

Online Control Tab: `SETNTRIP ON "RTCM3_NAD83" "Joe01" "A3b4D5"`

PARITY – Parity is a method of detecting errors in transmission. This field can be set to either NONE, ODD or EVEN. The default for all GPS receivers is NONE.

ROAM and **ROAMLIST** – Are advanced 900MHz Radio settings and should only be modified by dealers.

SERVER – The value for this field can be either a URL or IP address. This value is given to you by your RTK Corrections provider. If the value directs you to an NTRIP caster it is critical that the NTRIP setting also be updated. If the value directs you to a raw TCP/IP data source you need to set NTRIP to

OFF, see example 2 above. Typical ports values used for NTrip connections are 8080, 2101, and 10000.

HyperTerminal Example: `$PPNI,SETSERVER,209.12.132:2101`

Online Control Tab: `SETSERVER 209.12.132 2101`

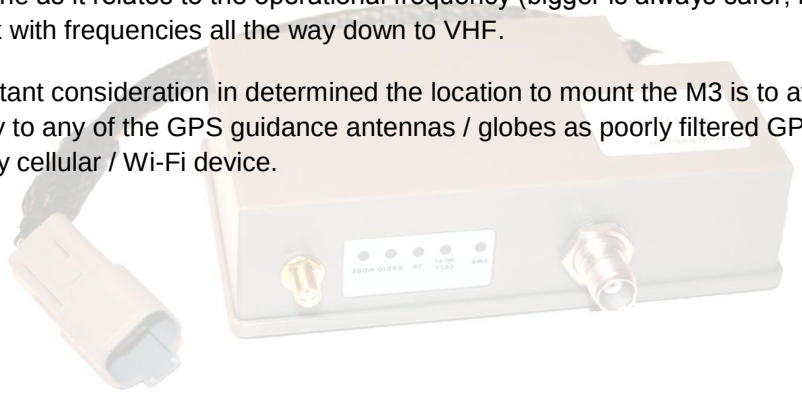
Installation

When installing your Base-N-aBox M3 RTK Bridge it's important to consider the physical environment:

MODEM Antenna Location

If you are operating in areas of questionable cellular coverage utilize the supplied external antenna mount and/or amplifier. Mount the cellular antenna as high as possible and as perpendicular to the surface as possible. If mounting the antenna on a boat, mount the antenna level based on the boat at normal operational/surveying speed taking into account the boats "squat"). Most high gain antennas require a "Ground Plane" for optimal operation. Refer to your antenna's documentation on the size of the ground plane as it relates to the operational frequency (bigger is always safer, i.e. a 24" ground plane will work with frequencies all the way down to VHF.

Also, an important consideration in determined the location to mount the M3 is to avoid mounting in close proximity to any of the GPS guidance antennas / globes as poorly filtered GPS Receivers can be affected by any cellular / Wi-Fi device.



12 Volt Power

Power should be supplied from a conditioned/regulated power source for optimal performance. The power must be between 9 VDC and 25 VDC, i.e. 14 VDC from a standard automotive system is ideal.

Internal GPS Antenna

The main requirement of the internal GPS Antenna is that it has a good view of the sky. If it does not, it may delay the acquisition of the correct position delaying the login time to your RTK Provider and therefor it will take longer to achieve a Fixed RTK Position. In the situation where the internal GPS receiver cannot obtain a GGA position, the M3 RTK Bridge will fall back to the last stored/cached position after 3 minutes.

Installation Guides

The following sections are intended as a guide to assist a knowledgeable installer in configuring the Base-N-aBox M3 RTK Bridge to work with the respective systems below. These system specific guides were based on point in time setups and may be different now due to firmware updates and/or installed auxiliary equipment. If you find items that should be revised or noted please send an email to Support@Base-N-aBox.com.

If you have specific questions that are not addressed in the guides to follow please email them to support@Base-N-aBox.com. Also, refer to the cable pin out guide in Appendix D of this document for information on how you might build a custom cable. Once you have constructed a custom cable for your implementation send the cable end specifics and your pin-outs to Base-N-aBox at the email above so that we can produce a high quality version of this cable for similar installations in the future. The Base-N-aBox cables are constructed using the best methods known:

1. 1000 psi injection molded strain relief ends that prevents water intrusion and cable wear at the connectors
2. Multiple tuned EMI chokes which reduce electrical interference between system components
3. Heavy duty double shielded cable that extends the life of the cable in abusive environments
4. Crimped and soldiered gold connectors insure a reliable corrosion free connection
5. Custom end caps prevent damage to unused connectors during storage/transport

Please carefully read the appropriate sections of this document and the provided manuals for your specific system so that you have a complete understanding of the tasks involved before installing your Base-N-aBox M3 RTK Bridge.

If you require assistance with any portion of the installation manuals please contact Base-N-aBox or your local distributor for support.

Common replacement items:

Part Number	Description
M3-PROG-05	5 foot, 9 pin RS232 Cable (PC for Manual Setup, Outback, Paradyme, Ag332, radios, others…)
M3-JD-07	5 foot + 2 foot Extension, 4 pin Deutsch Cable (John Deere Direct Connect - No 900 MHz required)
M3-FMX-04	4 foot, 12 pin Deutsch Cable (Trimble FMX, FM1000, FM750)
M3-252NR-05	12 foot, 12 pin Deutsch Cable (Trimble 252, 262, 372, Case Pro500/600, AgLeader 5100)
M3-TRM-04	4 foot, 7 pin LEMO Shell 0 Cable (Trimble SNB, 5700, 5800, R8, R6, Ag 432 & 442)
M3-HPBPDL-02	2 foot, 5 pin LEMO Shell 1 Cable (Pacific Crest High Power Base 35 watt)
M3-LPBPDL-07	7 foot, 5 pin LEMO Shell 0 Cable (Pacific Crest Low Power Base 1-3 watt)
M3-CHC-06	6 foot, 10 pin LEMO Shell 0 Cable (CHC x91/x900 cable with power for both devices)
M3-332-04	4 foot, 12 pin CONXALL Cable (Trimble 332 and similar)

Part Number	Description
M3-STN-04	4 foot, 8 pin LEMO Shell 1 Cable (Satel Epic Pro)
M3-STO-04	4 foot, 15 pin DB15 Cable (Satel Epic - Old Style)
M3-AF-RM-001	AutoFarm A5 Roof Module Replacement/Interface Harness
CA-1391-06	SAE Fused Battery Hookup Lead Cable (06' default length) (IPX)
CA-1388-06	SAE Fused Battery Hookup Lead Cable with Alligator Clips (IPX)
CA-PTB001	SAE Bulkhead mount (includes integrated dust cap, gasket, and mounting hardware)
CA-SAECIG	SAE Cigarette Cord with fuse
AC-GNP	Ground Plane (includes two sided mounting tape)
TBD	900 MHz Antenna (SMA Male)
TBD	900 Receive Only Radio (Available, Q1 2013)
AMP-7W	7 Watt Cellular Amplifier (includes 5dBi mag mount antenna kit) [7 watts at 800, 2 watts at 1900]
AC-CARWALL	Wall to Car Adapter (100-240 VAC > 12 VDC)

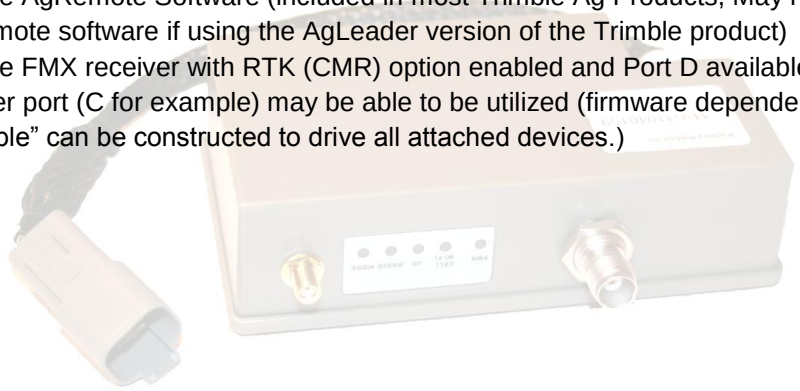
Note: The third number in the cable part number represents the standard length. Other lengths can be ordered.

Trimble FMX / FM1000 Direct Connect

The Trimble FMX receiver will typically be configured to accept CMR format RTK corrections from a Base-N-aBox M3 RTK Bridge which in turn has been configured to connect to a GPS reference network. The intended audience for this document is a dealer or integrator familiar with the FMX and access to the Set-up menus as well as general familiarity with the Base-N-aBox RTK Bridge. The Trimble Receiver can also be configured to receive industry standard RTCM correction with the appropriate unlock code from Trimble Dealer.

Requirements

1. Base-N-aBox M3 RTK Bridge to FMX Cable M3-FMX-04 (by default this cable is 4' long) Base-N-aBox M3 RTK Bridge with an active internet connection
2. Trimble AgRemote Software (included in most Trimble Ag Products, May need laptop with the AgRemote software if using the AgLeader version of the Trimble product)
3. Trimble FMX receiver with RTK (CMR) option enabled and Port D available (if Port D is used, another port (C for example) may be able to be utilized (firmware dependent), also a custom "Y-Cable" can be constructed to drive all attached devices.)



In order to operate the M3 RTK Bridge, you will need all the necessary information to access and log in to the Real-Time Network such as IP address, Port, Login Name, Password, Mount Point name, etc.

Note: You must utilize either the Base-N-aBox Programming Cable M3-PROG-05 or the online tool when setting up / testing the system. When you are done you can swap out the Programming cable.

Base-N-aBox RTK Bridge Settings

- Configure the Base-N-aBox M3 RTK Bridge to connect to GPS/GNSS Reference network and obtain CMR/CMR+ correction data stream from an appropriate single reference station, or network solution such as the so called VRS, FKP or PRS (A VRS/PRS network solution is

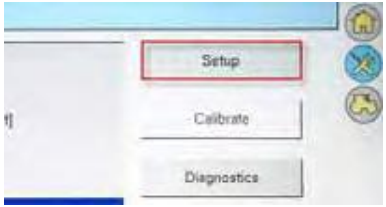
preferred as it will yield better accuracy and quicker initialization times in most situations over single baseline and MAC corrections).

- Configure the resulting RTK correction data to be output from the data port at a known baud rate (a baud rate of 38400 is recommended, but users also have success with the maximum baud of 115,200). MAKE SURE that both the FMX and M3 RTK Bridge have the same baud rate selected.

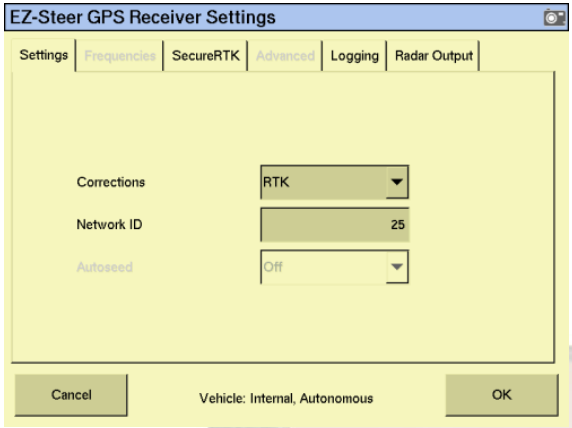
FMX (FM1000) Display

1. Turn on the FMX Unit, which will provide power to the M3 RTK Bridge.
2. Independently confirm the RTK correction data stream from the data port on the front of the unit. This can be accomplished by viewing data output from the data port into any terminal emulation software (i.e. HyperTerminal). Or, by viewing the CELL Wi-Fi light on the top of the Bridge.
3. Using the touch screen on the FMX, enter the configuration screen by selecting the “tools” button in the far upper right corner of the display.

4. Once you are in the “Configuration” screen, select the appropriate “GPS Receiver” option from the list (there may be more than one if active implement steering is installed):

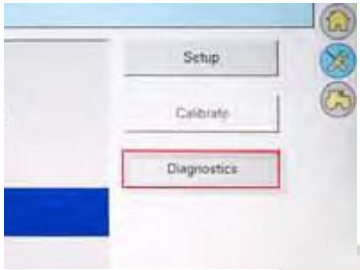


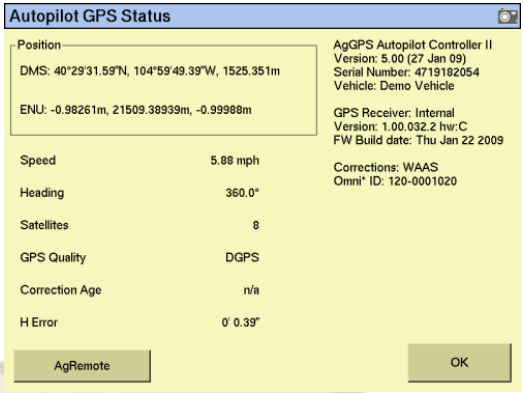
5. Select the Set-up tab and confirm the GPS is set Corrections to “RTK” and then tap “OK” to return back to main configuration page:



Note: your screen may look slightly different based on the number of integrated Receivers. If you have an additional receiver installed make sure the drop list is set to “Internal Primary”.

6. On the Configuration screen, select the Autopilot “GPS Receiver” plug-in and then tap “Diagnostics”. From the diagnostics screen, select the “AgRemote” button on the lower left:



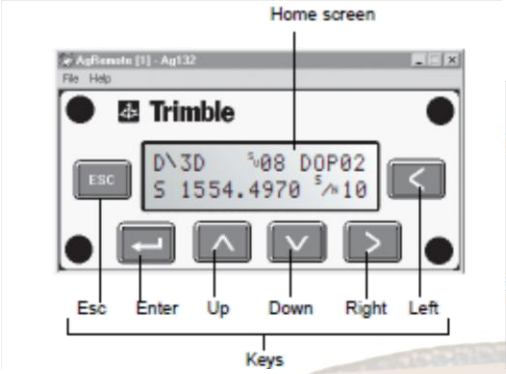


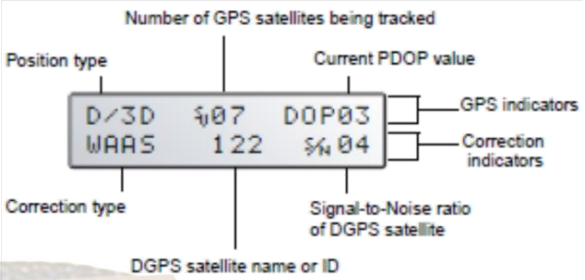
Notes:

a. The Autopilot GPS Status window is customizable

b. Some FMX firmware’s have a bug where they do not display the CMR % correctly in the FMX software display. You must go to the external AgRemote to see the correct CMR %.

7. Once in AgRemote toggle through the screen using the up/down arrows and the right/left arrows:



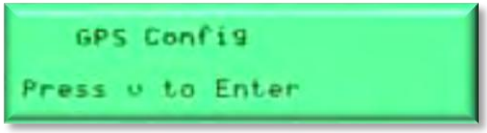


Note: Depending on the firmware version the arrow keys and ESC key may be located in other locations.

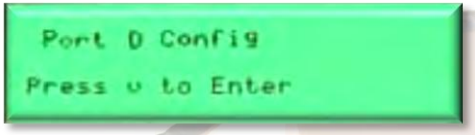
8. Using AgRemote, configure the D Port on the FMX receiver to receive RTK corrections in the CMR format at the same baud rate as configured in the Base-N-aBox M3 RTK Bridge

9. Press the “>” right arrow key two (2) times until the “Configuration” screen appears.

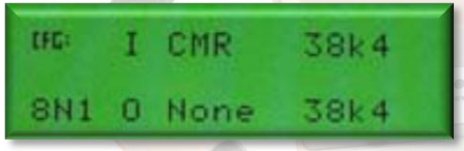
10. Press “V” down arrow to enter the “GPS Config” screen.



11. Press “>” right arrow six (6) times until the “Port D Config” screen appears.



12. Press the “V” down arrow button to display the Input Output settings for Port D.



13. Verify that “I” Input is set to CMR and that the Baud Rate is 38k4 with8N1 and output set to either None or NMEA.

Notes:

1. Some versions of firmware for the Trimble FMX and FM1000 do not allow simultaneous output of NMEA and input of CMR from Port D. If this is the case then the GGA message returned to your RTK Corrections provider will be the GGA as calculated from the M3 RTK Bridge.
2. Any supported baud rate can be used (i.e., 115K, 9600, etc.) just be sure to set the same baud rate in the M3 RTK Bridge .

Confirm the Base-N-aBox M3 RTK Bridge is correctly configured and is operational. The main status view in AgRemote should report that it is receiving RTK corrections and you should fix in about 60 seconds:

CMR Q:%86 A:2.0
Age of RTK signal, in seconds, since last RTK correction received.
Quality indicator: percentage of good RTK correction received.
Receiver is using CMR RTK corrections.

Your “Q” will increase towards 100% after a couple of minutes (this is a rolling average over the last 120 seconds).

Age “A“ should never be higher than 3 seconds. Some cellular carriers perform better than others, for example a 4G or 3G network will typically have latencies less than 1 second, but older 2G networks you will typically see 1-3 second latencies. Also, a CDMA network such as Verizon will also typically have lower latency on average than a GSM network as CDMA doesn’t prioritize data below voice traffic.

You should now be able to return to the main screen to view your positioning mode. GPS only Trimble receivers will typically take 30-60 seconds to achieve a fixed RTK solution (sub inch).

Trimble CFX-750

The 750 is one of the more recent product releases by Trimble and is therefore a bit more developed on the connection of an external device like the Base-N-aBox M3 RTK Bridge.

1. You'll use the Base-N-aBox Cable M3-FMX-04 plugged into Port A [Blue Square].
2. Configure the M3 RTK Bridge for 38400
3. Go into GPS Configuration on the 750 and select "Generic CMR Radio"
4. Set 38400, None, 8 and 1 for port settings.

Trimble AG 252 / 262 Direct Connect

While very similar to the FMX setup on the prior pages there are some slight differences (primarily the ports). The Trimble 252/262 receivers will typically be configured to accept CMR format RTK corrections from a Base-N-aBox M3 RTK Bridge which in turn has been configured to connect to a GPS reference network. The intended audience for this document is a dealer or integrator familiar with the Trimble 252/262 receivers and access to the Set-up menus as well as general familiarity with the Base-N-aBox M3 RTK Bridge. The Trimble Receiver can also be configured to receive industry standard RTCM correction with the appropriate unlock code from Trimble.

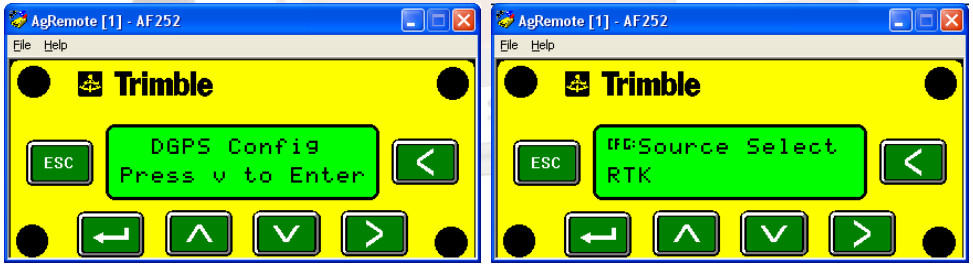
Requirements

1. Base-N-aBox M3 RTK Bridge to Trimble 252/262 No Radio Cable M3-252NR-05 (the 05 is the length which is variable by special order). An additional cable is available which has an extra 12 pin connector that allows you to hot-swap between the Trimble RTK Radio module and the Base-N-aBox M3 RTK Bridge without changing the cables.
2. Base-N-aBox M3 RTK Bridge with an active internet connection
3. Trimble AgRemote Software (included in all Trimble Ag Products, May need laptop with the AgRemote software if using the AgLeader version of the Trimble products)
4. Trimble 252 or 262 receiver with RTK (CMR) option enabled and Port C available (if Port C is used, another port (B for example) may be able to be utilized (firmware dependent), also a custom "Y-Cable" can be constructed to drive all attached devices.
5. In order to operate the M3 RTK Bridge, you will need all the necessary information to access and log in to the RTK corrections source such as IP address and port, Login Name, Password, Mount Point name, etc.

Base-N-aBox RTK Bridge Settings

- Configure the Base-N-aBox RTK Bridge to connect to GPS/GNSS Reference network and obtain CMR/CMR+ correction data stream from an appropriate single reference station, or network solution such as the so called VRS, FKP or PRS (A VRS/PRS network solution is preferred as it will yield better accuracy and quicker initialization times in most situations over single baseline and MAC corrections).
- Configure the resulting RTK correction data to be output from the data port at a known baud rate (a baud rate of 38400 is recommended, but users also have success with the maximum baud of 115,200). MAKE SURE that both the FMX and M3 RTK Bridge have the same baud rate selected.

AG Remote

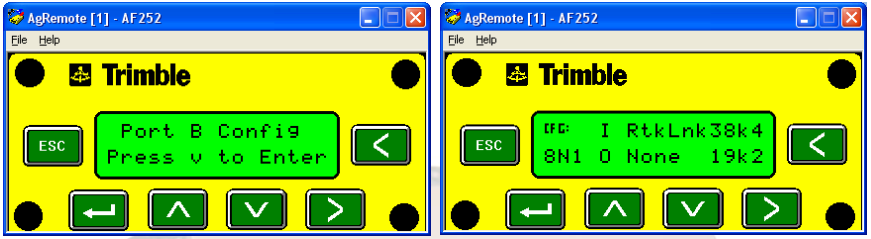
1. Start the Ag Remote program from either your laptop or FMD Display
2. Using AgRemote, configure the Ag252/262 receiver to receive RTK corrections in the CMR format from Port B at a baud rate of 38400
3. Configure DGPS Options – select the source as RTK
4. 

5. Configure Port B – configure the “I” Input is set to CMR or RtkLnk and that the Baud Rate is 38k4 with8N1 and output set to either None or NMEA.

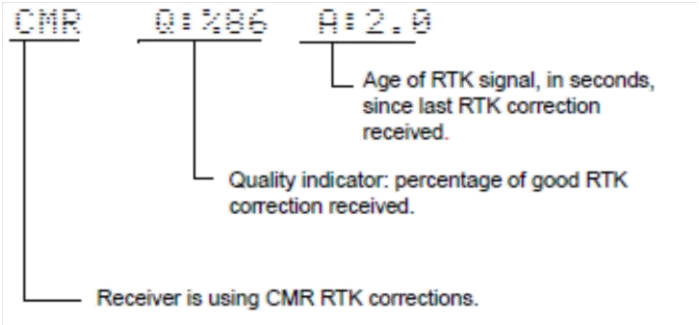
   Notes:

   a. If you do not configure NMEA out (GGA) then the GGA message returned to your RTK Corrections provider will be the GGA as calculated from the M3 RTK Bridge.

   b. Any supported baud rate can be used (i.e., 115K, 9600, etc.) just be sure to set the same baud rate in the M3 RTK Bridge.



6. Confirm operation –The main view in AgRemote should report that it is receiving RTK corrections.


CMR Q:%86 A:2.0
Age of RTK signal, in seconds, since last RTK correction received.
Quality indicator: percentage of good RTK correction received.
Receiver is using CMR RTK corrections.

A second confirmation of Fixed RTK operation can also be seen on the roof-mounted 252/262 receiver as a green light next to the ports location:

FMD Display

Load the base station screen to see the Navigation Status and Corrections age.

Trimble EZ 500 Direct Connect

While very similar to the FMX setup on the prior pages there are some slight differences (primarily the ports). The Trimble EZ500 and similar receivers will typically be configured to accept CMR format RTK corrections from a Base-N-aBox M3 RTK Bridge which in turn has been configured to connect to a GPS reference network. The intended audience for this document is a dealer or integrator familiar with the Trimble 252/262 receivers and access to the Set-up menus as well as general familiarity with the Base-N-aBox M3 RTK Bridge. The Trimble Receiver can also be configured to receive industry standard RTCM correction with the appropriate unlock code from Trimble (usually free).

Requirements

1. The standard M3 Programing cable M3-PROG-05:
   An external power cable for the M3 RTK Bridge, for example the Deere Accessory power cable (M3-JDSF-AMP):
2. Trimble RTK CMR unlock for the EZ500
3. Trimble AgRemote Software (included in all Trimble Ag Products, May need laptop with the AgRemote software if using the AgLeader version of the Trimble products). Also, you may need the “EZ Steer Extension Cable” or, any cable recommended by Trimble for access/configuration of the AgRemote software
4. In order to operate the M3 RTK Bridge, you will need all the necessary information to access and log in to the RTK corrections source such as IP address and port, Login Name, Password, Mount Point name, etc.

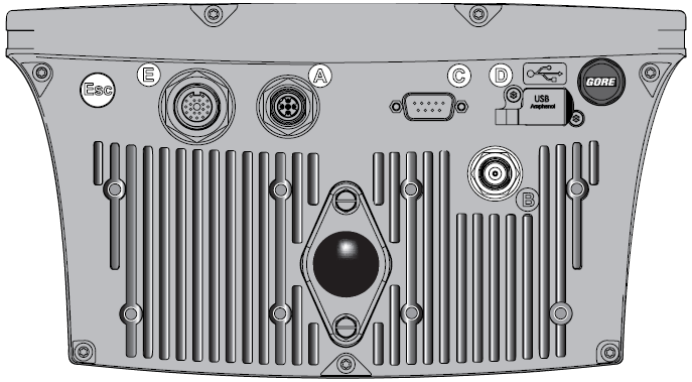
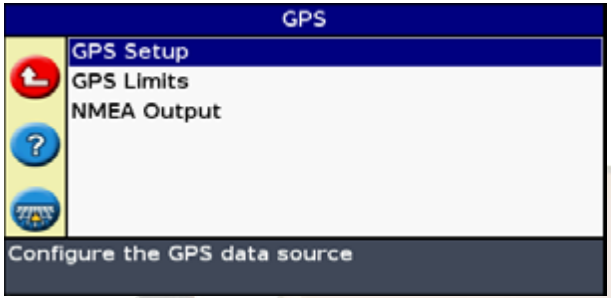


Figure 1 - Back view showing port C.

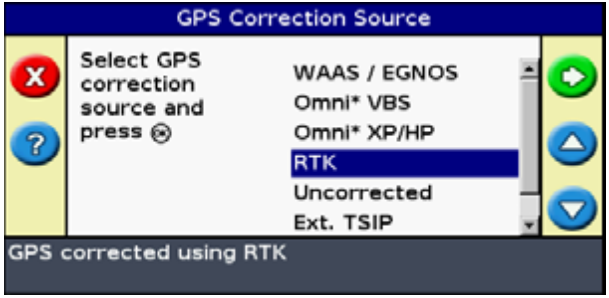
1. Using the M3-PROG cable, connect the Base-N-aBox M3 to the C Port on the back of EZ-Guide 500 (see diagram above).
2. With the EZ 500 you will need to install a separate DC power cable to provide power to the M3 RTK Bridge.
3. Connect setup data/power cabling to the EZ-Guide 500 Port C and a serial port on a PC running AgRemote. Apply power and connect to the EZ-Guide 500 with AgRemote.

Configuring the Lightbar

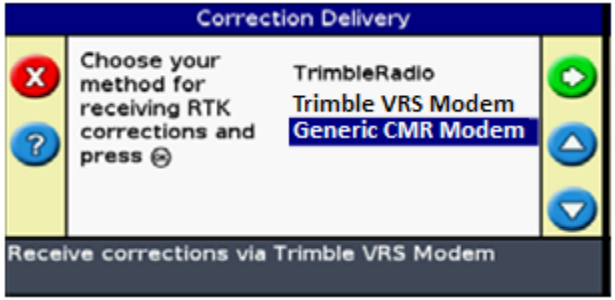
1. From the main guidance screen select the blue tool icon , then press the OK button. The Configuration screen will then display.
   Note: Verify that the user mode is set to “Advanced” (to change to Advanced mode, select “Configuration” > “User Mode”)
2. Select System > GPS > “**GPS Setup**”:



608 3. From within the GPS Corrections Source screen select "**RTK**":

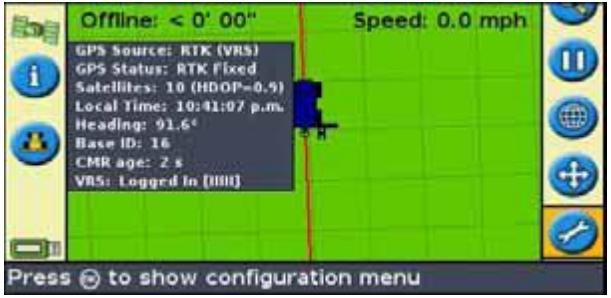


609
610 4. From within the Correction Delivery screen select "**Generic CMR Radio**":


Correction Delivery
Choose your method for receiving RTK corrections and press
TrimbleRadio
Trimble VRS Modem
Generic CMR Modem
Receive corrections via Trimble VRS Modem

611
612

To verify that you are receiving RTK Corrections go to the map screen:



CMR Age should never be higher than 3 seconds. Some cellular carriers perform better than others, for example a 4G or 3G network will typically have latencies less than 1 second, but older 2G networks you will typically see 1-3 second latencies. Also, a CDMA network such as Verizon will also typically have lower latency on average than a GSM network as CDMA doesn't prioritize data below voice traffic.

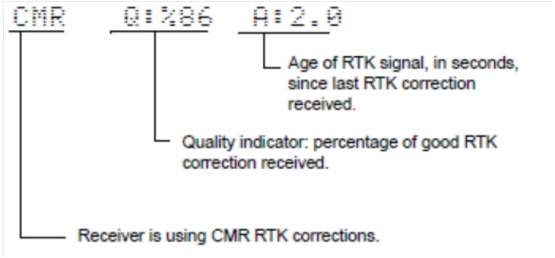
If you are not RTK Fixed, you will need to verify the settings loaded into AgRemote:

Ag Remote

1. Under the DGPS Options page, set the source as RTK:

2. For Port C configure “I” input to be “Generic CMR Radio” at a baud rate of 38400 or 115,200 (make sure the M3 RTK Bridge data baud is set identically):

Confirm the Base-N-aBox M3 RTK Bridge is correctly configured and is operational. The main status view in AgRemote should report that it is receiving RTK corrections and you should fix in about 60 seconds:


CMR Q:%86 A:2.0
Age of RTK signal, in seconds, since last RTK correction received.
Quality indicator: percentage of good RTK correction received.
Receiver is using CMR RTK corrections.

Your “Q” will increase towards 100% after a couple of minutes (this is a rolling average over the last 120 seconds).

Age “A“ should never be higher than 3 seconds. Some cellular carriers perform better than others, for example a 4G or 3G network will typically have latencies less than 1 second, but older 2G networks you will typically see 1-3 second latencies. Also, a CDMA network such as Verizon will also typically have lower latency on average than a GSM network as CDMA doesn’t prioritize data below voice traffic.

You should now be able to return to the main screen to view your positioning mode. Trimble GPS Only receivers will typically take 30-60 seconds to achieve a fixed RTK solution (sub inch).

John Deere – Direct Connect

Requirements

1. John Deere RTK unlocked receiver:
    a. 3000 series receiver
    b. RTK activation
    c. AutoTrac SF2 activation (aids loss of corrections with RTK Extend)
2. Base-N-aBox M3 RTK Bridge with an active internet connection and JD Subscription.
3. M3-JD-07 cable (which includes a 2 foot extension for quick disconnect)
4. In order to operate the M3 RTK Bridge, you will need all the necessary information to access and log in to the RTK corrections source such as IP address and port, Login Name, Password, Mount Point name, etc.

Installation steps:

1. Open the globe so that you can locate the 4 pin square connector.
2. Install the 2 foot cable supplied with the kit so that the female connector is outside the globe for easy removal of the receiver.
3. Mount the M3 and its external antenna using the supplied brackets to the top of the cab.

Display Example

Will vary based on the display and firmware version.

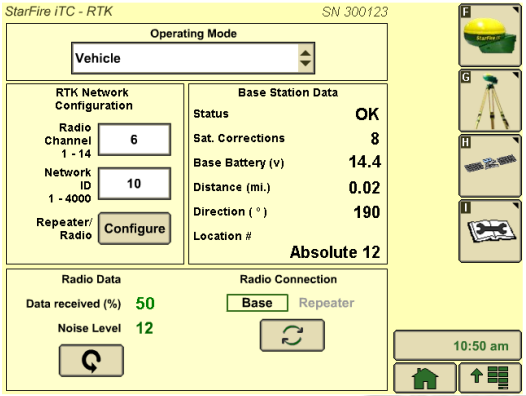
1. Press
2. Press

, then Press

The iTC Main Info screen will display.
3. Press

to display the base station status and radio configuration screen.
4. Set the Operating mode to Vehicle or Vehicle Repeater depending on your use.
5. Change the Radio Channel (1-14) number to the _____ number as set during the Bridge Setup. For example 6 (default).
6. Change the Network ID (1-4000) number to the _____ number as set during the Bridge Setup. For example 10 (default).

7. You should now see your Base Station Data update:

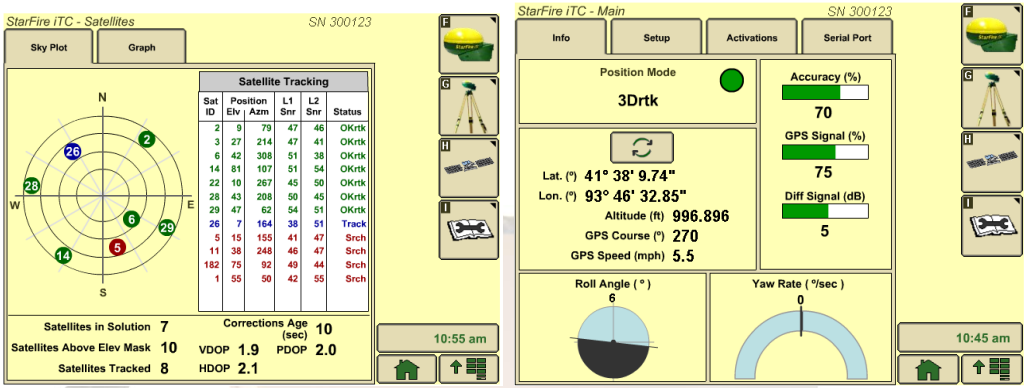


Notes:

a) On some older firmware versions it is necessary to press the

b) When properly connected to the RTK VRS Network you will typically see 50% Data received and a distance to the base station of a very small amount. This amount may vary based on your overlay providers Hz rate. DO NOT WORRY, 30% to 100% are all the same, Deere duplicates the RTK correction message 10 times so there is no loss in accuracy from a 10% value to a 100% value. Values less than 30% when “Vehicle” only is set, will cause the system to switch between Base and Repeater.

c) You can also press the to view more information on the RTK Status. If you are in a very sparse area of the VRS network the Deere receiver may take a bit longer to initialize to an RTK Solution:



John Deere – Utilizing 900 MHz Radios

Requirements

1. John Deere RTK Radio Kit, the following is needed to complete a vehicle kit:
    a. SF2 Ready StarFire™ iTC Receiver
    b. RTK radio (900 MHz only – 450 not currently supported)
    c. RTK activation
    d. Any Deere RTK Display (Original GreenStar's Display and Mobile Processor, GS2 display, etc.)
    e. AutoTrac SF2 activation (aids loss of corrections with RTK Extend)
2. An external Accessory Power Port Power Cable
3. Base-N-aBox M3 RTK Bridge with an active internet connection and JD Subscription.
4. Standard M3-PROG cable and a null modem adapter
5. FreeWave 900 MHz Radio
6. Windows Laptop/PC with an available 9 pin serial port
7. In order to operate the M3 RTK Bridge, you will need all the necessary information to access and log in to the RTK corrections source such as IP address and port, Login Name, Password, Mount Point name, etc.

2600 Display Example

1. Press

2. Press

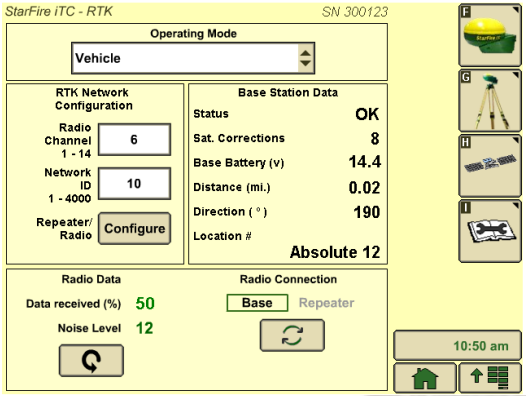
, then Press

The iTC Main Info screen will display.

3. Press

to display the base station status and radio configuration screen.
4. Set the Operating mode to Vehicle or Vehicle Repeater depending on your use.
5. The channel and frequency key are not used and can be set to anything you like.

6. You should now see your Data Received (%) update.



Notes:

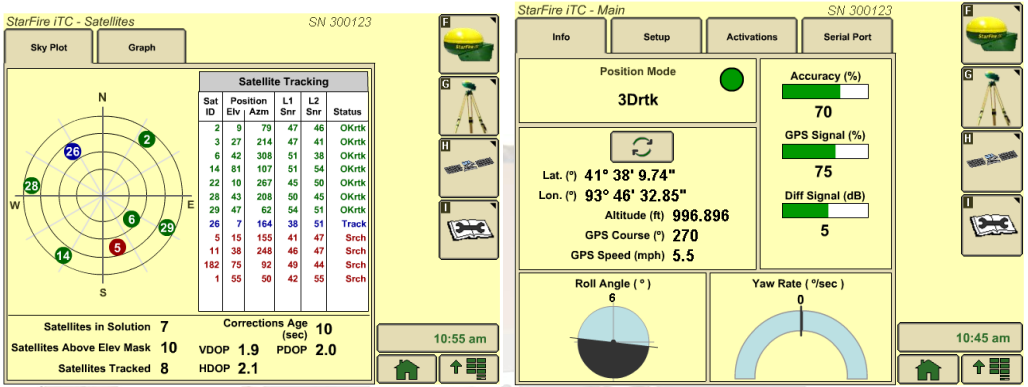
d) On some older firmware versions it is necessary to press the

e) When properly connected to the RTK Network you will typically see 50% Data received and a distance to the base station (if running on a VRS style network a very small distance will be shown). The Data received % may vary based on your network providers Hz rate. DO NOT WORRY, 30% to 100% are all the same, Deere duplicates the RTK correction message 10 times to improve reception in poor RF environments so there is no loss in accuracy from a 10% value to a 100% value. Values less than 30% when “Vehicle” only is

set, will cause the system to switch between Base and Repeater in some firmware revisions.

f) You can also press the

to view more information on the RTK Status. The Deere 3000 Receivers will typically initialize to an RTK Fix in less than 10 seconds if they have GNSS corrections.



Original GreenStar Display Example

1. Press the

button

2. Press the StarFire Receiver button
3. Set the Operating mode to “Vehicle” or “Vehicle Repeater” depending on your use (see below).
4. Change the Radio Channel (1-14) number to the _____ number as set during the Bridge Setup. For example 6 (default).
5. Change the Network ID (1-4000) number to the _____ number as set during the Bridge Setup. For example 10 (default).

FreeWave 900 MHz Radio Settings

Condition	Master		
	Carrier Detect (CD)	Transmit (TX)	Clear to Send (CTS)
Powered, no link	Solid red bright	Solid red bright	Solid red bright
Linked, no Repeater, sending sparse data	Solid green	Intermittent flash red	Intermittent flash red
Master calling Slave through Repeater	Solid red bright	Solid red dim	Solid red bright
Master linked to Repeater, not to Slave	Flashing orange	Solid red dim	Solid red bright
Repeater linked to Slave	Solid green	Intermittent flash red	Intermittent flash red
Mode 6 - waiting for ATD command	Solid red bright	Off	Blinking red
Setup Mode	Solid green	Solid green	Solid green

Setting up the Transceiver using HyperTerminal

Note: The terms Modem and Transceiver are used interchangeably in this manual and in the text of the Setup menu. While the words have different meanings, the two terms should be treated as one and the same when referring to FreeWave products.

Note: Included on the User Manual CD is the optional “EZConfig” transceiver setup program and instructions. This program eliminates the need to use HyperTerminal to program the transceivers. For FGR2-series radios, EZConfig 3.4 or later will need to be used.

Note: The FGR2-series radios may also be programmed via the FreeWave Tools Suite software which is included on the User Manual CD. This program replaces EZConfig as the configuration software.

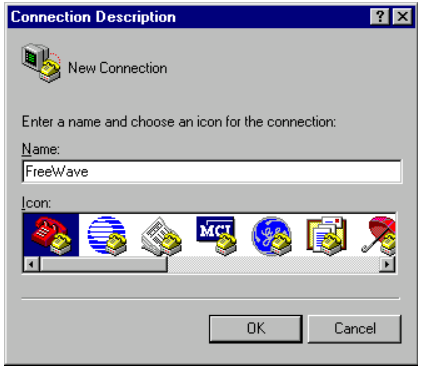
Once the transceiver is powered and connected with the programming cable to the programming computer, it can be programmed for use through HyperTerminal or EZConfig.

The following describes how to set HyperTerminal to program the transceivers. Accessing HyperTerminal's Setup Menu

Note: The following screen shots are taken from a computer using Windows XP. The display may vary slightly if using different operating systems.

1. Click on the Start button. A cascading menu appears. Select Programs, Accessories, Communications and then HyperTerminal. A window appears similar to the following:

2. Double-click on the **Hypertrm.exe** icon. The following window appears:

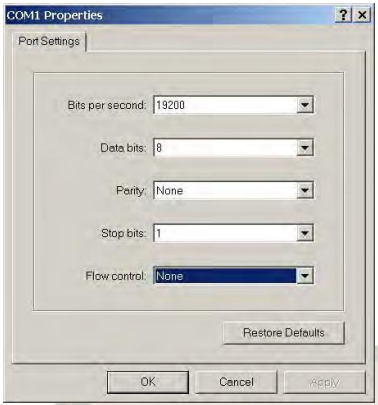


3. In the Name text box, type in a descriptive name. Select an icon from the Icon selection box.

4. Click on the **OK** button. The following “Connect To” dialog box appears:

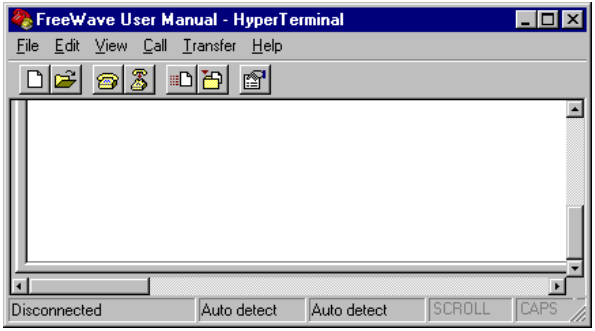
5. Select the connection type to be used from the **Connect using** drop-down menu. In most cases the connection type will be either **Direct to Com1.**

6. Click on the **OK** button. The Properties dialog box appears for the selected connection type.



7. The following are the port settings which must be set for a proper connection:
   a. Bits per second 19200
   b. Data bits 8
   c. Parity None
   d. Stop bits 1
   e. Flow control None

8. After selecting the appropriate menu items for each setting, click on the **OK** button. The following HyperTerminal dialog box appears:

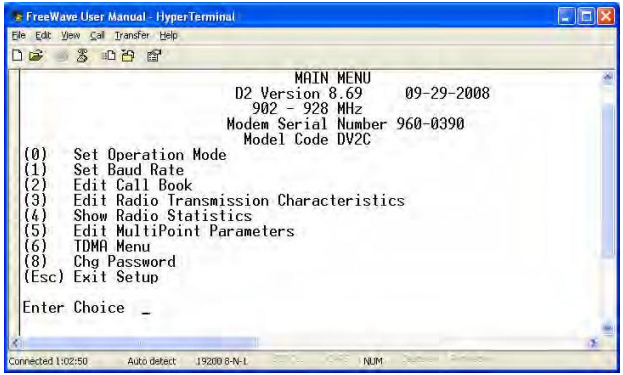


9. To connect HyperTerminal to the transceiver, press the Setup button on the back of the FreeWave transceiver.

Figure 2 - Model FGR2-CE(-U)

10. When Setup is invoked, the FreeWave Setup **Main Menu** will display in the HyperTerminal dialog box. All three LED's on the transceiver will light green

781 ■ ■ ■ and stay green as long as the transceiver is in the Setup mode.


FreeWave User Manual - HyperTerminal
File Edit View Call Transfer Help
MAIN MENU
D2 Version 8.69 09-29-2008
902 - 928 MHz
Modem Serial Number 960-0390
Model Code DV2C
(0) Set Operation Mode
(1) Set Baud Rate
(2) Edit Call Book
(3) Edit Radio Transmission Characteristics
(4) Show Radio Statistics
(5) Edit MultiPoint Parameters
(6) TDMA Menu
(8) Chg Password
(Esc) Exit Setup
Enter Choice _
Connected 1:02:50 Auto detect 19200 8-N-1 NUM

782
783 11. Save the HyperTerminal connection settings by selecting **Save** from the File
784 menu.

785 **IMPORTANT NOTE:** Whenever a change is made to the **HyperTerminal**
786 **settings** in an open terminal session, the connection must be disconnected
787 then reconnected before the settings will take effect.

788 **Note:** Once Setup mode has been invoked in HyperTerminal, the process of
789 exiting Setup mode involves pressing the Escape (Esc) key several times,
790 allowing the transceiver to connect to the network. Otherwise, cycling the
791 power is the alternative way to exit Setup mode.

Note: Do not “hot plug” radios to cycle power as this may cause damage to the circuitry and render the radio unusable.

12. Next you will need to set the Operation Mode by pressing “0” (zero)
13. Change Modem Mode to 2 (**Point to Multipoint Master**)
14. Press the Esc key once to return to the main menu
15. Press “1” one to set the baud rate of the data port.
16. Set the radio and Base-N-aBox M3 RTK Bridge to a baud rate of 115200.
17. Press the Esc key one to return to the main menu

Notes:

a) The Setup Baud Rate will ALWAYS default to 19,200 Baud no matter what the data port Baud Rate is set to.
b) A Baud Rate setting of 38400 or higher could cause data to be lost; it is recommended that one monitor a high baud rate closely at first to verify the equipment can handle the high rate.

18. Next you will need to set the Radio Transmission Characteristics by pressing “3” Three.
19. Set the Freq Key (GreenStar’s Radio Channel number minus 1). For example using the default of “6” a couple of pages early you would enter 5 here.
20. Press “F” for More and change 1 (Hop Table Size) from 112 to 105.
21. Then change Max Packet Size = 8
22. Min Packet Size = 9

23. Xmit Rate = 1
24. RF Data Rate = 3
25. RF Xmit Power = 2 (10 for max power if you are sending corrections to all tractors in range)
26. Slave Security = 1
27. RTS to CTS = 0
28. Retry Time Out = 30
29. Lowpower Mode = 0
30. High Noise = 0
31. MCU Speed = 0
32. RemoteLED = 1
33. Press Esc once to return to the main menu.

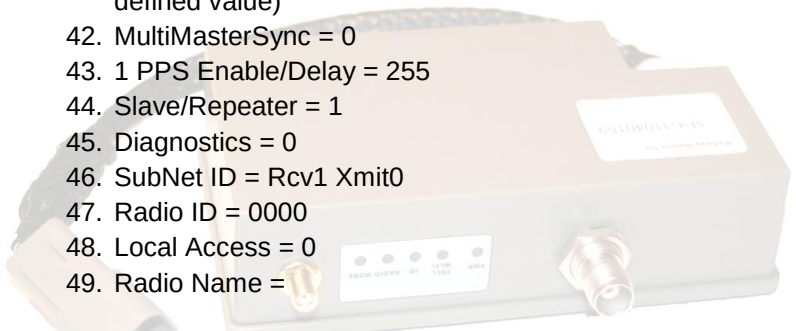
Notes:

a) The Retry Time Out parameter is ONLY useful when a Multipoint network has a roving Master or Slave(s). As the link gets weaker, a lower setting will allow a poor link to break in search of a stronger one.

b) Setting Retry Time Out to 20 is recommended in areas where several FreeWave networks exist. This setting will allow Slaves and Repeaters to drop the connection if the link becomes too weak, while at the same time prevent errant disconnects due to interference from neighboring networks. While intended primarily for Multipoint

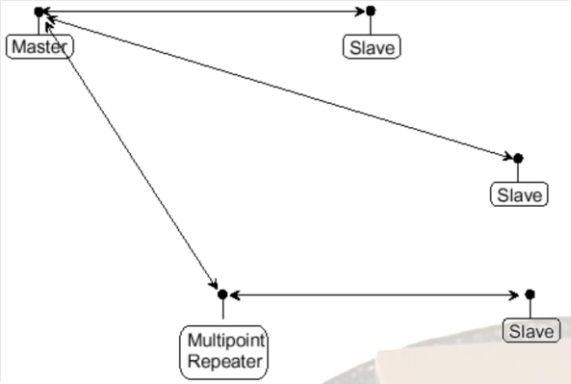
networks, the Retry Time Out parameter may also be modified in Point-to-Point networks. However, the value in Point-to-Point mode should not be set to less than 151.

34. Press “5” Five to modify the Multipoint Parameters
35. Number of Repeaters = 1
36. Master Packet Repeat = 2
37. Max Slave Retry = 9
38. Retry Odds = 9
39. DTR Connect = 0
40. Repeater Frequency = 0
41. Network ID = 0010 (GreenStar’s Network ID number) or any other user defined value)
42. MultiMasterSync = 0
43. 1 PPS Enable/Delay = 255
44. Slave/Repeater = 1
45. Diagnostics = 0
46. SubNet ID = Rcv1 Xmit0
47. Radio ID = 0000
48. Local Access = 0
49. Radio Name =



The example to follow depicts a standard Point-to-Multipoint network. From the Master being the Base-N-aBox RTK M3 RTK Bridge. In this example; any data that is broadcast from the M3 RTK Bridge (master) to all three Slaves (John Deere SF Equipped Tractors), one of which receives it

through a Multipoint Repeater. The data is in turn sent out of the serial port of each of the three Slaves into the John Deere SF Globe.



Troubleshooting HyperTerminal

The following are some common issues encountered while using HyperTerminal.

1. Nothing appears on the screen after pressing the Setup button on the transceiver.
   This usually indicates one of two things; either the wrong Com port is selected or a null modem RS-232 cable is being used. Follow the steps below to change the Com ports.
   1. Click on the Disconnect button.
   2. Select Properties from the File menu.

3. Click on the Connect To tab and verify that the correct Com port is selected.
4. Click on the OK button to close the Properties dialog box.
5. Click on the Call button. Return the transceiver to Setup mode. The Setup menu screen should appear.

2. Gibberish appears on the screen after pressing the Setup button.
   a. This usually indicates a Baud Rate problem. Follow the steps below to change the Baud Rate.
      a. Click on the Disconnect button.
      b. Select Properties from the File menu.
      c. Click on the Configure button.
      d. Change the Baud Rate to 19200 and Flow Control to None then click on the OK button.
      e. Click on the OK button to close the Properties dialog box.
      f. Click on the Call button.
      g. Return the transceiver to Setup mode. The Setup menu screen should appear.
3. The Setup menu appears on the screen, but nothing happens when keys on the keyboard are pressed. This usually indicates:
   a. A poor quality USB to Serial Adapter (Purchase a Higher Quality Adapter with Proper TTL Levels or hook the system up to a computer with a native Serial Port.
   b. a three-wire connection, Rx, Tx, & Gnd. Follow the steps below if the connection uses a three-wire connection:
      i. Click on the Disconnect button.

ii. Select Properties from the File menu.
iii. Click on the Configure button.
iv. Change the Flow Control to None and click on the OK button.
v. Click on the OK button to close the Properties dialog box.
vi. Click on the Call button.
vii. Return the transceiver to Setup mode. The Setup menu screen should appear.

4. A connection exists, data is being received through HyperTerminal, and some data is correct, but the remaining data is in unrecognizable characters. This usually indicates a parity mismatch. To resolve this issue, ensure that the parity of the transceiver and the parity of HyperTerminal are set the same. HyperTerminal's parity settings are under Properties and the FreeWave parity is found under the Baud Rate in the Setup mode.
    a. Click on the Disconnect button.
    b. Select Properties from the File menu.
    c. Click on the Configure button.
    d. Change the Parity to None and click on the OK button.
    e. Click on the OK button to close the Properties dialog box.
    f. Click on the Call button.
    g. Return the transceiver to Setup mode. The Setup menu screen should appear.

FreeWave Technical Support

For up-to-date troubleshooting information check the Support page at www.FreeWave.com .

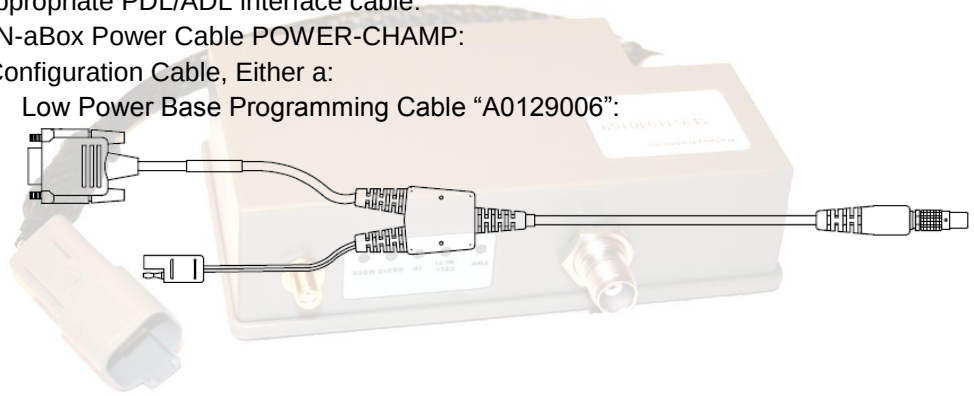
FreeWave provides Technical Support, Monday through Friday, 8:00 AM to 5:00 PM, Mountain Time (GMT -7) Call toll-free at 1-866-923-6168 or factory direct after hours at 303-381-9200 or email at moreinfo@FreeWave.com .

Pacific Crest Radios

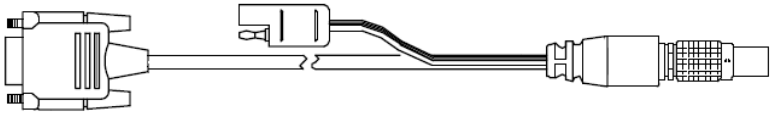
The Pacific Crest LPB and HPB (Low Power Base and High Power Base) radios are very simple to configure. You will simply need to set the Parity to None and match the baud rates between the Base-N-aBox M3 RTK Bridge and the PDL radio (38,400 recommended). All other settings are dependent on your rover radios. Using the Base-N-aBox M3 RTK Bridge with a PDL radio allows you to extend RTK Network coverage into areas which do not have cellular connectivity and allows you to run multiple rovers on a pay for use network for the cost of a single rover unit. The intended audience for this document is a dealer or integrator familiar with the PdlConf program as well as general familiarity with the Base-N-aBox RTK Bridge..

Requirements

1. The appropriate PDL/ADL interface cable:
2. Base-N-aBox Power Cable POWER-CHAMP:
3. PDL Configuration Cable, Either a:
    a. Low Power Base Programming Cable “A0129006”:



b. High Power Base Programming Cable “A00470”:

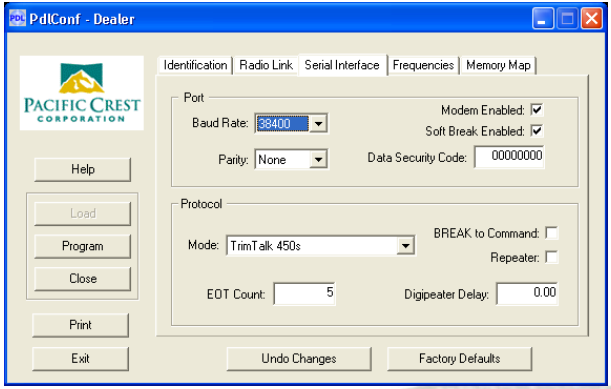


4. Base-N-aBox M3 RTK Bridge with an active internet connection
5. M3 RTK Bridge Tripod bracket.
6. An appropriate 12 volt power supply with two SAE power lines.

PDLConf Settings

1. Start either the PdlConf or PdlConfd – Dealer program.
2. Load the settings from the radio (if you have trouble with this step try switching your connection method by using the PDL icon menu on the window system menu in the far upper left corner of the application window).
3. Set the baud rate to 38400

4. Set the parity to None



5. To improve the reliability of the radio at system start up you can DISABLE the “Soft Break Enabled” option and also DISABLE the “BREAK to Command” Option.
6. All other settings need to match those used by your rover radio and should already be configured properly.
7. Once all the appropriate options have been set press the Program button.

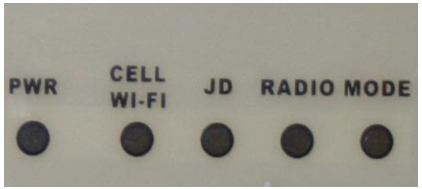
To verify the system is working you should see the TX light flash about once a second when connected to an active M3 RTK Bridge. MAKE SURE the data port baud rates are set the same on both the M3 RTK Bridge and the PDL radio.

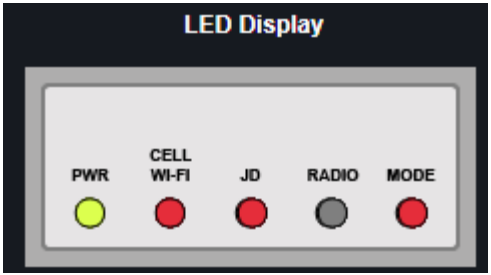
Hydrographic Systems

HyPack Software

You will need to use “Custom GPS Codes” found in GPS Setup > General tab. Make sure RTK Fixed is 4, RTK Float is 5, DGPS is 3, Autonomous is 1, No Solution is 0, WAAS and Dual Frequency is 2. Other values may also be needed, consult with Hypack technical support for the appropriate codes for your system.

Appendix A – Status Indicators





This section describes the meaning of the five LED indicator lights on the top of the Base-N-aBox M3 RTK Bridge and on the Information screen in the remote web setup tool.

Power

This light is used to indicate the status of the M3 power source and to signal remote updating of firmware or settings:

Solid	Unit is powered
Flashing (for only 6 seconds at startup)	Indicates that the modem is checking the Base-N-aBox Master Control server for settings which were changed while the M3 was offline.
Flashing (for a long time + Cell/Wi-Fi light is ON)	Indicates that the modem is downloading a new firmware.

Flashing (for a long time & Cell/Wi-Fi light is OFF)	Indicates that the M3 is in the process of installing the newly downloaded firmware (do NOT remove power until this process is complete).

CELL Wi-Fi

This light indicates if there is an active data connection to the corrections server:

Off	No internet connection
Solid	Connected to the Internet and attempting to login to the programmed corrections provider. *If the modem stays in this state for an extended amount of time, verify with your service provider that the base station / server you are connected to is online and streaming data.
Flash	Data is being transferred from configured server to the serial port.

JD

This light indicates that the M3 RTK Bridge is licensed to operate on a John Deere system and that it is actively communicating with the 3000 or ITC Globe:

Off	Not connected to a Deere Globe or Not Authorized
Solid	Communicating with a Deere Globe and emulating the Deere Freewave 900 MHz Radio

970 **RADIO**

971 This light indicates the status of the internal 900 MHz radio:

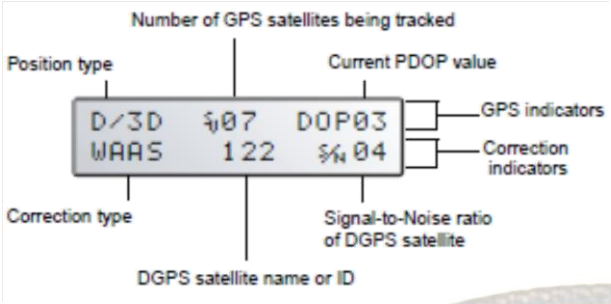
Off	Radio is either not installed or is turned OFF
Solid	Radio is transmitting
Flash	Radio is receiving corrections from another M3 with the 900MHZ set to ON

972 **MODE**

973 This light indicates the general status of the M3:

Off	Firmware not loaded in memory yet
Solid	Modem has booted and is able to be communicated with via its serial port (i.e., any HyperTerminal program – CTRL+Z @ 19,200 Baud).

974 # Appendix B – Trimble AgRemote Reference



975

Key Assignments

Press the AgRemote keys to access menus and screens where you can view the receiver status, change the receiver configuration, control the receiver utility/guidance functions, enter data, select options.

The action associated with each of the AgRemote keys depends on whether a menu or a screen is displayed. Below is a general list of the actions for each key depending on the screen that is displayed:

Key	Action	Active Screen
Enter	Return to the top of the menu when an Exit Screen appears after the last screen in a menu	From the Home Screen: Changes Satellite DGPS Source Mode. From the Lock Display CFG screen: Displays the Enter Password Screen. From other screens: performs an action associated with that screen.
Down Arrow	Moves down a menu level. Display the first screen from a lower level menu.	Move down through the screens in a menu. Move down through the list of options in a multiple choice field.

Key	Action	Active Screen
Up Arrow	Move up a menu level.	Moves up through the screens in a menu. Moves up through the list of options in a multiple choice field.
Left/Right Arrow	Move horizontally through the upper and lower level menus. Move from the last upper level menu to the Home Screen.	Selects the next alphanumeric or multiple choice field on a screen. When alphanumeric or multiple choice fields are available the CFG symbol appears in the corner of the PC based version of AgRemote. Moves to the next letter or digit of a field.
Esc Escape	Move up one menu level until you return to the home screen.	Move from a screen to a menu screen for that screen. If pressed again: returns to the previous level. If pressed again: returns to the Home Screen.

982 **Navigating the Menus and Screens**

983 AgRemote uses menus and sub-menus to organize configuration and status screens.

AgRemote displays menus such as Field Operations, Status, and Configuration. These are accessed from the Home screen. Use a menu to navigate to another menu or a sub-menu.

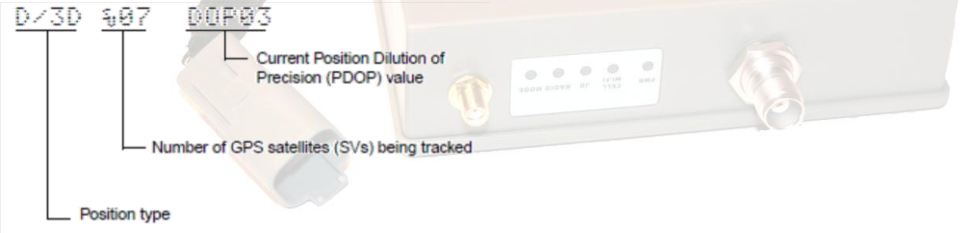
Each menu has one or more lower level menus (sub-menus) which are used to access status and configuration screens. Use screens to view the receiver status or to change a configuration setting.

Not all menus, sub-menus, and screens are available for all receivers. For a diagram showing the full menu system, see the navigation map for your receiver and associated firmware in its documentation or contact your local Trimble Reseller.

When you are using the receiver front panel keypad to navigate the menu system, press the up arrow and down arrow simultaneously to move to the previous menu. Press and hold (or press repeatedly) the up and down arrows simultaneously to return to the Home screen.

GPS Position Information

The first line of the Home screen displays general GPS positioning information for the type of signal that is being used.


D/3D 07 DOP03
Current Position Dilution of Precision (PDOP) value
Number of GPS satellites (SVs) being tracked
Position type

Display	Description
SRCH	Searching for Satellites (no position or time)
TRCK	Tracking Satellites (no position)
G/2D	Autonomous 2D position (uncorrected)
G/3D	Autonomous 3D position (uncorrected)
h/3D	OmniSTAR HP3D Un-converged position
H/3D	OmniSTAR HP 3D Converged position
D/2D	DGPS 2D position
D/3D	DGPS 3D position
r/3D	RTK Float position (not Initialized)
R/3D	RTK Fixed position (Initialized)

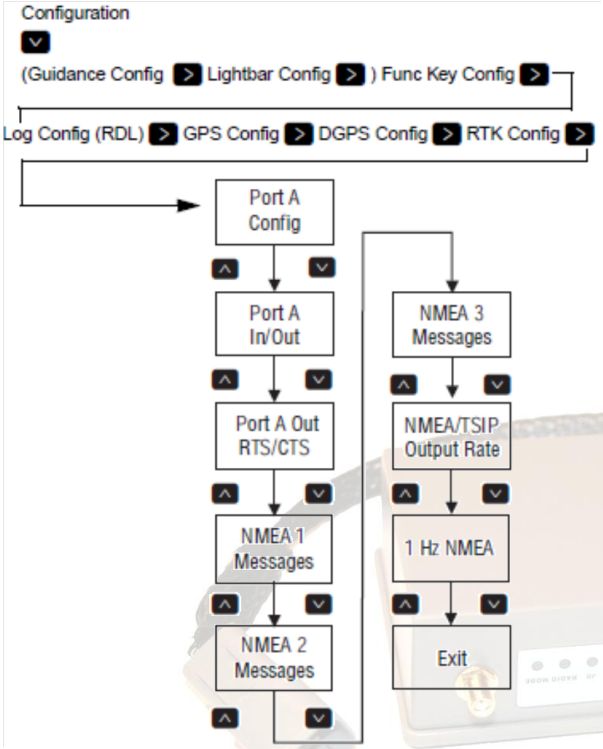
When the receiver is in RTK mode the second line of the Home screen displays the status indicators below:

CMR Q:%86 A:2.0
Age of RTK signal, in seconds, since last RTK correction received.
Quality indicator: percentage of good RTK correction received.
Receiver is using CMR RTK corrections.

Configuring the Communication Ports

Some AgGPS receivers have eight serial ports. Through these ports (RS-232 and CANBUS), the receiver can communicate with multiple devices simultaneously. Configure the communication ports to ensure that the receiver outputs the correct GPS position data type for the hardware device or software program that is connected to the receiver and that it is receiving corrections properly.

Note: As all ports are configured in the same way, this section describes only Port A



1007

1008 Below is the description for the various Input / Output communication settings for each port:

Setting	Description
TEXTB	The receiver can accept ASCII data from an external device, such as a chlorophyll meter, on Port A, merge it with NMEA GPS data, and output the combined data on Port B. The incoming data must be limited to 66 ASCII characters and must be terminated by a carriage return and line feed (hex characters 0x0D 0x0A). The NMEA string outputs as $PTNLAG001,<up to 66 ASCII characters>*<2 digit checksum><CR><LF>. For the receiver to output the combined NMEA string, NMEA must be selected as the output protocol on Port B.
TEXTA	See the description for the TEXTB setting. TEXTA outputs on Port A, not Port B.
RTCM	The receiver can accept RTCM data from an external DGPS device, such as an FM pager.
TSIP	The receiver can accept or output TSIP data packets from the port when using the AgRemote program.
LBAR	The receiver can accept or output data from the AgGPS Lightbar. You must select this setting when you use the AgGPS Parallel Swathing Option. Note – The AgGPS Lightbar is not supported by all receivers.
CMR	The receiver can accept real-time corrections (CMR data) from an external source, such as a Trimble radio.
RTKLNK	The receiver can accept real-time corrections (CMR data) from an external source, such as a Trimble radio.

Configuring the receiver to operate in RTK

To configure the receiver:

1. Connect the receiver to the computer. Turn on the receiver and start the AgRemote software.

2. In AgRemote, select Configuration / DGPS Config.

3. Set the Source Select field to RTK.

4. Press ENTER on the AgRemote display then press ESC to complete this part of the procedure.

5. Connect the Base-N-aBox M3 RTK Bridge to an available receiver port. Then change the port input settings for that port to RtkLnk or CMR and set the baud rate to match (typically 38400).

Weird things to note:

When setting the baud rate, note the following:

- If you are using 19200 or 38400, the input rate must match the output rate.
- If Port A is operating at 19200, Port B can operate at 1200, 2400, 9600, or 19200 (not 38400).
- If Port B is operating at 38400, Port A can operate at 1200, 2400, 9600 and 38400 (not 19200).
- These limits do not apply to the AgGPS 252 receiver.

Some guidance programs will restore the settings changed in AgRemote setting them back to defaults. If this happens to you look for a Toggle called “Initialize GPS Receiver” or “Reset GPS Receiver on Startup” or any setting that has a similar meaning and make sure it is disabled.

Appendix C – Cell Amplifiers and External Antennas

By utilizing an External Cellular Antenna and/or Cellular amplifier not only will you increase the areas that you get reception but you will increase your data speed. By increasing your data speed you will decrease your latency which will improve your RTK accuracy.

There are two different cellular amplifiers offered by Base-N-aBox and your local Base-N-aBox Resellers, each with a specific approach to performance:

819 Direct Connect Amplifier

The 819 direct connect amplifier is the single best amplifier on the market for improving the reception and trough put of data for wireless carriers in the 850 and 1900 MHz bands (excluding iDEN systems). If you goal is maximum reception and performance for your cellular data card or cellular modem then this is the amplifier you should be using.

Kits typically include all that you need to getup up and running including a 5dB external magnetic mount antenna. This antenna will require at least a 9” steel ground plan for optimal performance.

819 Multiple Device Repeater Amplifier

The SVW819 is a great solution for a car, mid-size SUV's, tractor cabs or Hydrographic boat. This single unit works with all carrier's 850 and 1900 MHz cellular networks (excluding iDEN systems) This is the In-Vehicle amplifier that will change cellular communications, as you know it. This product will handle 5 users simultaneously regardless of carrier. Unlike other products in the marketplace this product really works! Everyone gets equal power there is no drop off with additional users.

Kits typically include all that you need to getup up and running including a 5dB external magnetic mount antenna. This antenna will require at least a 9" steel ground plan for optimal performance.

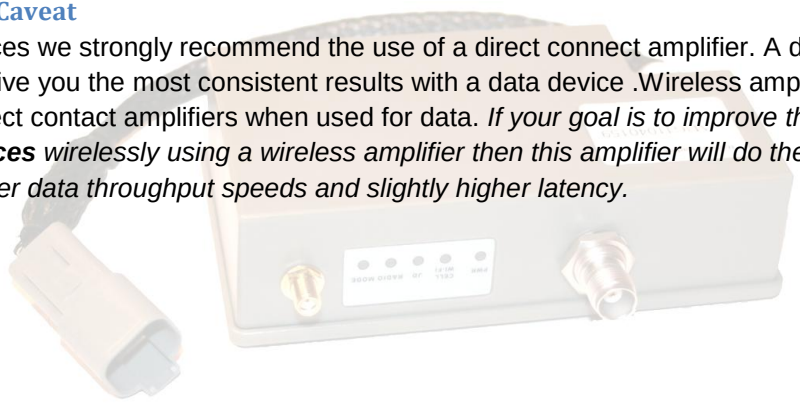
Note: You will need to purchase an “Adapter Cable” which will connect directly to M3 RTK Bridge. Base-N-aBox stocks over 200 adapter cables for nearly all cellular devices. We even have special inductive cradles for devices that do not have an external antenna port (for example some of Verizon’s early Mi-Fi’s)

General Specifications

Input Voltage 8.0 VDC – 28.0 VDC
Current draw 100 to 890 MA
RF Input Power 10 – 60mW
Receiver Sensitivity -110dBm (maximum)
Signal Sensitivity -115dBm (maximum)

Performance Caveat

For Data devices we strongly recommend the use of a direct connect amplifier. A direct connect amplifier will give you the most consistent results with a data device .Wireless amplifiers are not as reliable as direct contact amplifiers when used for data. *If your goal is to improve the signal on* ***multiple devices*** *wirelessly using a wireless amplifier then this amplifier will do the job but may result in overall slower data throughput speeds and slightly higher latency.*



Inductive Cradle

This Cradle/Adapter/Holder is fully adjustable to hold most devices currently on the market. It can be used with direct connect amplifiers as well as Wireless amplifiers. Ideal for the iPhone , Droids, and any device with interior antennas such as the NovAtel MiFi. The inductive cradle comes with 4 feet of RG174 cable directly wired and a TNC Male Connector. This multi-function adapter/cradle is perfect addition to any amplifier Kit. No more mounting Velcro adapter on your phone and Utilize the hands free speaker phone feature on your PDA.

External Antennas

The M3 RTK Bridge is supplied with a great performing external antenna, however, you may still want to select a more optimal antenna based on your specific requirements for performance, aesthetics and EMI environment. The general classifications that we break antennas down for discussions sake are:

- Magnetic Mount
- Glass Mount
- NMO Mount
- Mirror Mount
- Roof Mount
- Marine and Multipurpose

Each of these types are discussed below in more detail:

Magnetic Mount

Magnetic Mount Antennas are portable and improve signal on any vehicle with a steel exterior. They work well on automobiles, pickup trucks, vans, SUVs and can easily be moved from one vehicle to another. When used on the cab of a tractor they typically require a metallic ground plan to be added to achieve their stated gain characteristics. A ground plan is nothing more than a piece of sheet metal attached to the roof by two sided tape.

Glass Mount

Glass Mount Antennas require no alterations to the vehicle but are more permanent than Magnetic Mount Antennas. The antenna base attaches to either side of a piece of the vehicle glass with a 3M

adhesive. They work well on automobiles, SUVs, tractors and enclosed boats but cannot be easily moved from one vehicle to another, so, you may want to purchase one for every vehicle you'll utilize the Base-N-aBox M3 RTK Bridge or external amplifier in.

Note: Glass Mount Antennas are NOT recommended for use with wireless amplifiers (amplifiers that support multiple headsets). They are ok for use with DIRECT connect amplifiers. If you use one of these with the reradiating amplifiers you must shielded the inside antenna and outside antenna from each other to prevent oscillation (not an easy task).

NMO Mount

Non-Magnetic Option (NMO) Mount Antennas mount through the metal roof or trunk of a vehicle (drilling a hole required). NMO Mount Antennas are frequently used on police cars, fire trucks, ambulances, public utility service trucks and other dedicated vehicles. These do not work well on tractor cabs as most require a ground plan for proper gain.

Mirror Mount

Mirror Mount Antennas mount on a bracket on large vehicles such as 18-wheelers, RVs, tractors and combines, or boats. The 3/8-24 threaded base will fit many existing antenna bases. These antennas are large but offer good performance.

Roof Mount

Roof Mount Antennas mount through the non-metallic roof of boats, tractors, combines and vehicles such as RVs, fifth-wheels, and trailers. Some of these types of vehicles have fiberglass, plastic or

rubber roofs. These antennas are designed for operation without a ground plane or have the ground plane built-in.

Marine and Multipurpose

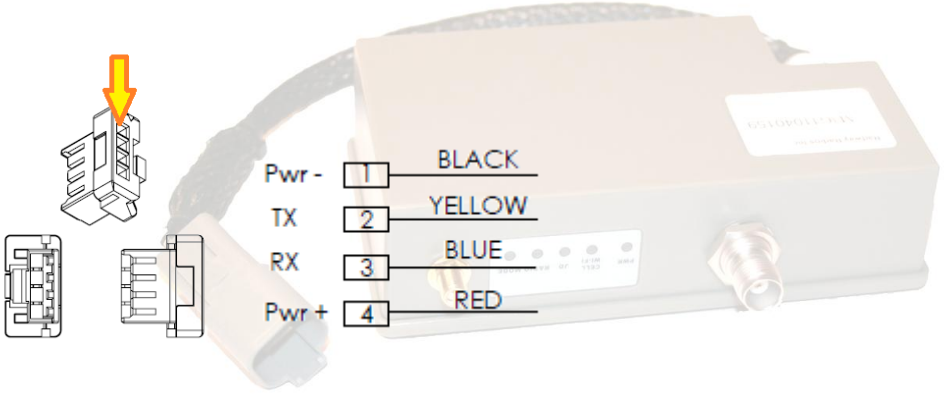
Marine grade antennas are typically larger fiberglass antennas which shield the radiating element from the corrosive effects of saltwater. They are also able to be mast mounted to help them overcome the curvature of the earth for use offshore and long distances from the nearest cell tower. With a proper mast and cellular amplifier use of the Base-N-aBox M3 RTK Bridge up to 30 miles offshore can easily be accomplished.

These antenna systems are typically much more expensive but include marine grade mounting hardware for active pivoting and positioning.

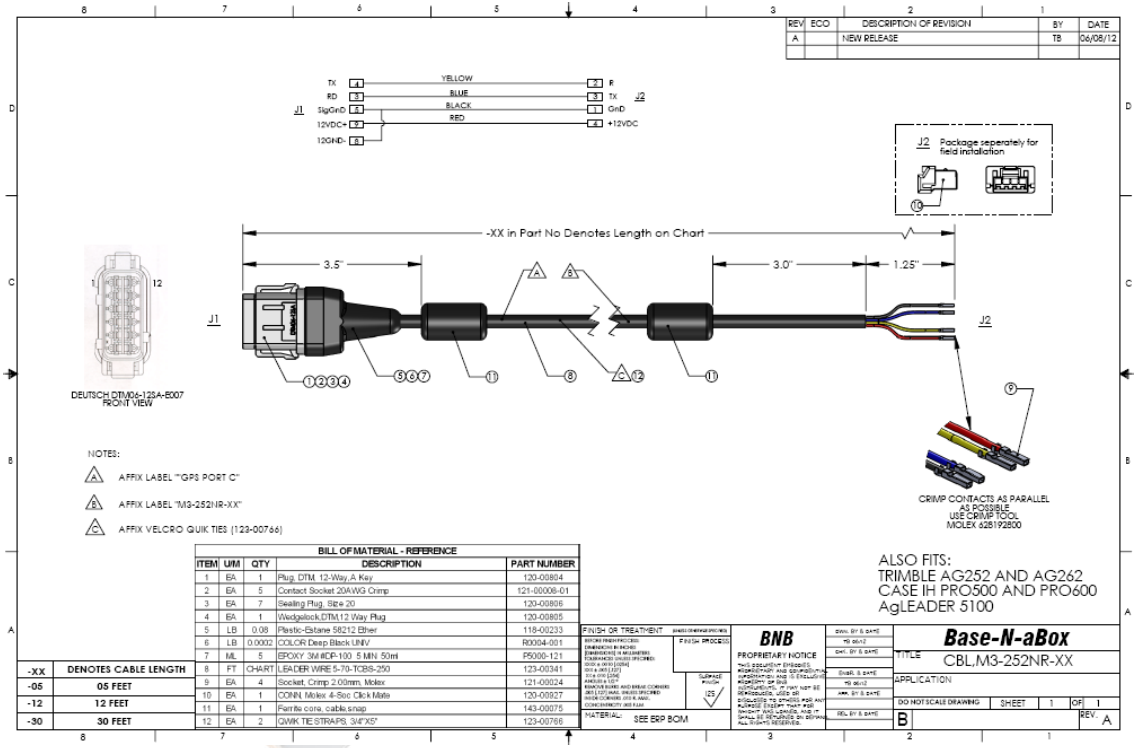
Appendix D – Cable Schematics

Do not build your own cables except to test pin-outs. Once a Prototype cable is built, send either the prototype cable or a complete schematic to Base-N-aBox for Engineering review and production. The final Base-N-aBox cables are built to standards higher than any system on the market with features such as: individually insulated gold pins, EMI chokes, fully sealed and IPX tested, injection molded ends and abrasion resistant cabling. They are also verified to be compatible with other cable combinations insuring a quality solution for your end-users.

Molex 502439-0400 connector requires crimp tool 628192800. Note: the Arrow (and small triangle molded into the back side of the connector indicate pin 1):



1132 **Note:** Detailed Cable Schematics like that shown below are available on request.


REV ECO DESCRIPTION OF REVISION BY DATE
A NEW RELEASE TB 06/08/12
TX 4 YELLOW 2 R
RD 5 BLUE 3 TX J2
J1 SigGnD 6 BLACK 1 GnD
12VDC+ 9 RED 4 +12VDC
12GND- 8
J2 Package seperately for field installation
-XX in Part No Denotes Length on Chart
3.5"
3.0"
1.25"
J1
J2
DEUTSCH DTM06-12SA-E007 FRONT VIEW
CRIMP CONTACTS AS PARALLEL AS POSSIBLE USE CRIMP TOOL MOLEX 62819200
NOTES:
A AFFIX LABEL "GPS PORT C"
B AFFIX LABEL "M3-252NR-XX"
C AFFIX VELCRO QUIK TIES (123-00766)
BILL OF MATERIAL - REFERENCE
ITEM U/M QTY DESCRIPTION PART NUMBER
1 EA 1 Plug, DTM, 12-Way, A Key 120-00804
2 EA 5 Contact Socket 20AWG Crimp 121-00008-01
3 EA 7 Sealing Plug, Size 20 120-00806
4 EA 1 Wedgelock,DTM,12 Way Plug 120-00805
5 LB 0.08 Plastic-Estane 58212 Ether 118-00233
6 LB 0.0002 COLOR Deep Black UNIV R0004-001
7 ML 5 EPOXY 3M #DP-100 5 MIN .50ml P5000-121
8 FT CHART LEADER WIRE 5-70-TCBS-250 123-00341
9 EA 4 Socket, Crimp 2.00mm, Molex 121-00024
10 EA 1 CONN, Molex 4-Soc Click Mate 120-00927
11 EA 1 Ferrite core, cable,snap 143-00075
12 EA 2 QWIK TIE STRAPS, 3/4"X5" 123-00766
-XX DENOTES CABLE LENGTH
-05 05 FEET
-12 12 FEET
-30 30 FEET
FINISH OR TREATMENT
MATERIAL: SEE ERP BOM
BNB
PROPRIETARY NOTICE
ALSO FITS:
TRIMBLE AG252 AND AG262
CASE IH PRO500 AND PRO600
AgLEADER 5100
Base-N-aBox
TITLE CBL,M3-252NR-XX
APPLICATION
DO NOT SCALE DRAWING SHEET 1 OF 1
B REV. A

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Appendix E – Glossary

APN (Access Point Name)

Identifies an IP packet data network, that a wireless mobile data user communicate with. An APN may also be used to define the type of service and the priority of that service. For example a group of users may setup a special APN for their RTK data that insures high priority and low latency vs. a generic APN which detects RTK data as a stagnant webpage and therefore lowers its priority and can even cause a loss of data. APN's are used in 3GPP data access networks like AT&T, Cingular and T-Mobile. CDMA networks do not use APN's as they always prioritize data on its own channel.

CDMA

Is a family of 3G mobile technology standards used primarily by Verizon, Sprint, Alaska Digital, MetroPCS and US Cellular. It uses CDMA channel access, to send voice, data, and signaling data between mobile phones and cell sites. The set of standards includes: CDMA2000 1X, CDMA2000 EV-DO Rev. 0, CDMA2000 EV-DO Rev. A, and CDMA2000 EV-DO Rev. B. All are approved radio interfaces for the ITU's IMT-2000. CDMA2000 has a relatively long technical history and is backward-compatible with its previous 2G iteration IS-95 (cdmaOne). In the United States, CDMA2000 is a registered trademark of the Telecommunications Industry Association (TIA-USA). The successor to CDMA2000 is LTE, part of the competing 3GPP family.

dGPS

A form of corrected GPS giving enhanced accuracy in the few decimeter range (better than standalone GPS, not as good as RTK).

Several dGPS services are available ranging from Coast Guard Beacons, WAAS, LAAS, private and government operated CORS / Network GPS systems.

Encryption Mode

Encrypting your wireless network accomplishes two things: it helps keep out bandwidth hogs (i.e., your neighbors) who would otherwise use your Wi-Fi for free Internet, and it helps prevent intruders from breaking into your system to snoop around your PC.

Because there are multiple encryption modes the question is then which is the best? Of course, most wireless routers have encryption turned off by default, so any choice you make is better than none at all. The three prevailing standards for wireless encryption are described below:

- **WEP:** Wired Equivalent Privacy (or Wireless Encryption Protocol) is the original protection scheme included with early wireless routers, and it is also the weakest. With the right software, an intruder can easily break into a WEP-protected network in a few minutes using the Related-key attack. This is considered almost obsolete technology so use WEP only if you have older PCs or devices that don't support the newer types described below.
- **WPA**: Wi-Fi Protected Access was established as a stopgap measure to remedy the vulnerabilities in WEP. If you have any Windows XP machines on your network, they'll need

Service Pack 2 to connect to a WPA encrypted network. Specifically, the Temporal Key Integrity Protocol (TKIP), was brought into WPA. TKIP uses R64 encryption for securing data.

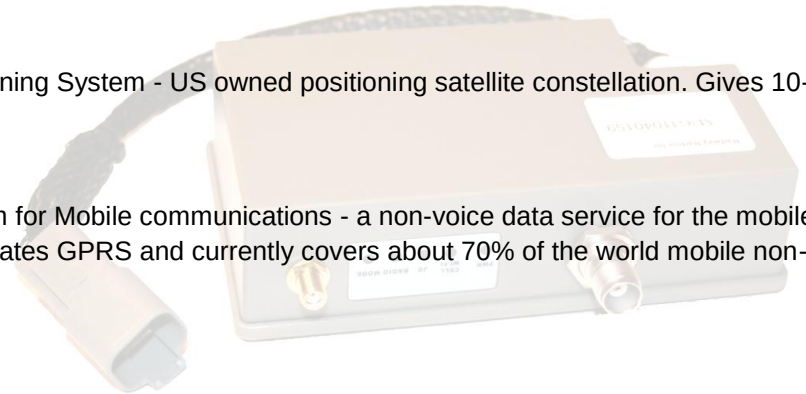
- **WPA2/PSK**: Also known as 802.11i or PSK for Pre-Shared Key, WPA2 is the completed form of WPA, and is considered the strongest nonproprietary encryption scheme for 802.11x wireless networks. WPA2 implements the mandatory elements of 802.11i. In particular, it introduces a new AES-based algorithm which is considered fully secure and better than TKIP.

GNSS

Global Navigation Satellite System - Generic term for systems such as GPS and Galileo.

GPRS

General Packet Radio Service - a non-voice data service for the mobile telephone network.



GPS

Global Positioning System - US owned positioning satellite constellation. Gives 10-20 m accuracy as standard.

GSM

Global System for Mobile communications - a non-voice data service for the mobile telephone network. Predates GPRS and currently covers about 70% of the world mobile non-voice market.

NTRIP

The NTRIP “network” consists of three types of applications namely NTRIPClient, NTRIPServer and NTRIPCaster. The NTRIPCaster operates as a real server or splitter (HTTP) and the programs NTRIPClient and NTRIPServer act more like clients according to the classical internet communication that is usually based on the classic server / client principle (one or more servers share resources with users within a network). The communication between NTRIPServer and NTRIPCaster as well as NTRIPClient and NTRIPCaster is fully compatible HTTP 1.1. In case of losing the TCP (Transmission Control Protocol) connection between the described communicating system components (NTRIPServer-NTRIPCaster, NTRIPClient-NTRIPCaster) the involved TCP-sockets will recognize this and ensure a fully automated reconnection.

NTRIP “network” consists of

- NTRIPSources, generating DGPS and RTK data streams at specific locations
- NTRIPServers, transferring data from one or multiple sources to NTRIP
- NTRIPCaster, major broadcaster, integrated between data sources and data receivers

NTRIPSource ID’s are called “mount points” so a NTRIPClient has the choice to select a mount point where he thinks this fits in best. To provide the NTRIPClient with suitable information the NTRIPCaster offers a list of mount points that is called the source-list. This source-list is maintained by the NTRIPCaster and provides the Client with a variety of attributes such as coordinates and format identifier. When an NTRIPClient requests a wrong mount point and/or no mount point is available, the NTRIPCaster answers by uploading a new source table via HTTP. The NTRIPClient gets new information via this new source-list, an eventual GNSS data stream is blocked due to no availability.

NTRIPSource

The NTRIPSource is a GNSS receiver that provides continuous GNSS data such as RTCM-104 corrections that refer to a known or specific location. A US organization, the Radio Technical Commission for Maritime Services (RTCM), works within a special Committee No. 104 (SC- 104) with standards for real time transfer of observations of satellite based navigation systems for differential applications. The special committee is responsible for RTCM standards for differential GNSS. The HTTP-based TCP protocol NTRIP is currently undergoing this procedure via the special committee No. 104 to become a worldwide standard.

NTRIPServer

In practice, the NTRIPServer is software running on a conventional PC that sends correction data from a GNSS receiver (COM-port) to a third installation (from NTRIPSource to NTRIPCaster). As an example NTRIP could be used within a virtual reference network where the protocol is able to transport RTCM data. The RTCM corrections could be taken into consideration at the user's approximate position. As an example this virtual reference station data is comparable with a NTRIPSource that could be transmitted by one of the NTRIP components, the NTRIPServer. As a summary the NTRIPServer transports GNSS data of an NTRIPSource (GNSS receiver) directly to the NTRIPCaster. Before doing this in the described way the NTRIPServer sends a request to the mountpoint via HTTP 1.1. After the connection is established the data can be sent via TCP/IP.

NTRIPCaster

The NTRIPCaster is in general a HTTP server and acts, as already described, as a broadcaster integrated between the data sources (NTRIPServer) and the data receiver (the NTRIPClients). The NTRIPCaster receives data streams from NTRIPServers (generated by NTRIPSources) and manages, for example, the handling of mount points for NTRIPSources, passwords, billing, and access.

The NTRIPCaster is based on the GNU General Public License developed Icecast software (http://www.icecast.org/) that was originally developed to stream MP-3 data with bit rates from 32 kbit/s up to 128 kbit/s. The current NTRIPCaster used by the Federal Agency for Cartography and Geodesy (BKG) is designed for:

- DGNSS corrections (about 0.5 kbit/s per stream)
- RTK GPS corrections (about 5 kbit/s per stream)
- Raw GNSS receiver data (about 9 kbit/s per stream).

RTCM

Radio Technical Commission for Maritime Services - an industry standard format for GPS data exchange based on real-time data.

RTK

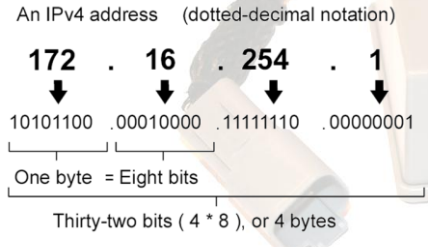
Real Time Kinematic - a form of corrected GPS giving accuracy down around 10 mm and requires both a base station (or virtual base station) and a rover usually within a distance of about 20 miles of each other.

IP Address

By definition An Internet Protocol address (IP address) is a numerical label that is assigned to any device participating in a computer network that uses the Internet Protocol for communication between its nodes. An IP address serves two principal functions; host or network interface identification and location addressing. Its role has been characterized as follows: "A name indicates what we seek. An address indicates where it is. A route indicates how to get there.

IPv4 addresses are usually represented in dot-decimal notation (four numbers, each ranging from 0 to 255, separated by dots, e.g. 208.77.188.166). Each part represents 8 bits of the address, and is therefore called an octet.

Internet Protocol addresses are assigned to a host either anew at the time of booting, or permanently by fixed configuration of its hardware or software. Persistent configuration is also known as using a static IP address. In contrast, in situations when the computer's IP address is assigned newly each time, this is known as using a dynamic IP address.


An IPv4 address (dotted-decimal notation)
172 . 16 . 254 . 1
10101100 .00010000 .11111110 .00000001
One byte = Eight bits
Thirty-two bits (4 * 8), or 4 bytes